CHARLES UNIVERSITY

FACULTY OF PHYSICAL EDUCATION AND SPORT

DEPARTMENT OF PHYSIOTHERAPY

Physiotherapeutic Procedure for Patient after Ischemic Cerebrovascular Accident (Stroke) in the pons

BACHELOR THESIS

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Prague, Czech Republic,
March 2017

ABSTRACT

Title of thesis: Physiotherapeutic Procedure for Patient after Ischemic Cerebrovascular Accident (Stroke) in The Pons.

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Work placement: Oblastní Nemocnice Kladno

Summary: In the thesis, I will be covering a case study diagnosed with ischemic cerebrovascular accident (stroke) in the pons. It will be divided into 2 parts (General – Practical).The general part explains the anatomical, biomechanical ,physiological and neurophysiological point view of the brain and brain stem corresponding to the object's diagnosis. The practical part shows the procedure of the treatment starting from the initial examinations with its conclusion, also the goal of the therapy, short and long rehabilitation plan and with day to day therapy sessions and the final examinations with its conclusion, the results of the therapy procedure, and the effectiveness of the treatment.

KEYWORDS: Cerebrovascular Accident, Ischemic Stroke, Physiotherapeutic Procedure, Penumbra, Incoordination, Rehabilitation, Hemiparesis, Range of Motion, Drooped Foot, Gait Training, Balance Exercises, Verticalization, Spasticity.

DECLARATION

I hereby declare that this thesis was composed and written solely by myself with a direction of Doc. PaedDr. Dagmar Pavlů, Csc. All data in this thesis was written according to the listed Rescores and the knowledge which I gained during my study in University of Physical Education and Sport, Physiotherapy Department. I also confirm that my case study is an original case which I worked on during my practice in Oblastní Nemocnice Kladno, under the control of Bc.Tomas Modlinger.

Abdulaziz Abdullah Alrasheed

Prague, March 2017

DEDICATION

I dedicate this dissertation to my wonderful family who was always supporting me morally and financially, especially to my mother who was encouraging me and gave me strength during my study abroad, to my father who was always supportive and stood beside me, to my amazing sisters who was always proud of me and keeping me going forward, to my only brother for being emotionally strong seeing me leaving to study abroad when he was young, to my brother from another mother Abdullah who was always beside me and encouraging me during my study and believing in me, I'm grateful for everybody who was supporting and thinking of me.

ACKNOWLEDGMENT

First of all, I would like to thank my all my teachers for their great effort teaching me the priciples which i will need in my future studies. I appricate thier work morals during my studies in the faculty of physical education and sport, espieaclly the physitherapy department.

In this part i kindly would love to thank my wonderful supervisoer Doc. PaedDr. Dagmar Pavlů, Csc. the head of the Physical Therapy Department, for her instuctions, patience, knowledge and guidance which helped me all the time during my studies.

My sincere thanks also goes to Bc. Tomas Modlinger, for his great effort and help during my practice. It was such a great experience. Special thanks goes to my classmates who were such good friends, helping each other during our studies.

Table Contents

1. Introduction

As an introduction of my thesis, I will try to give the reader a comprehensive look of the physiotherapeutic procedures with general information about my Objective case study who was diagnosed with ischemic cerebrovascular accident (stroke) in the pons. The reason why I choose this diagnosis to be my case study due to my interest and passion to work and treat patients with cerebrovascular accident (CVA) and to regain their function abilities to integrate with the society normally.

This thesis will be divided into 2 parts (General/Practical) The general part explains and gives an idea about the anatomical, biomechanical, physiological and neurophysiological point view of the brain and brain stem corresponding to the object's diagnosis, also the main risk factors of the Stroke, moreover we will be talking about the Pathologies, Etiologies and the Epidemiology of the stroke.

The Practical part considers to be the crucial part of my thesis which was held in Oblastní Nemocnice Kladno, from 30.1.2017 until 10.2.2107 under the supervision of Bc.Tomas Modlinger. We will be showing the procedure of the treatment starting with the Anamnesis, the initial examinations with its conclusion, also the goal of the therapy, short and long rehabilitation plan and with the day to day therapy sessions.

Following approaches were according to my knowledge witch I gained from my teachers during my study at the Faculty of Physical Education and Sport, Physical Therapy Department. Moreover, I will mention precisely the final examinations with its conclusion, the results of the therapy procedures, and the effectiveness of the treatment and the prognosis. Finally, there will be a list of the (bibliography, tables, abbreviations, figures) also with attached informed consent and the approval from ethics committee.

2. General Part

2.1 Anatomy and Function of the Brain Stem

The stem of the brain is the most important area that serves as a link between the central nervous system, spinal cord and internal organs. It supervises the work of the heart, respiratory system, maintenance of body temperature, locomotor activity, regulates muscle tone, vegetative reactions, balance, sexual function, and participates in the work of the organs of sight and hearing, provides for chewing, swallowing, contains fiber taste buds. It is difficult to name the functions of the body, which would have been performed without the involvement of the brain stem (Aliberti, 2017) as can be seen on Figure 1.

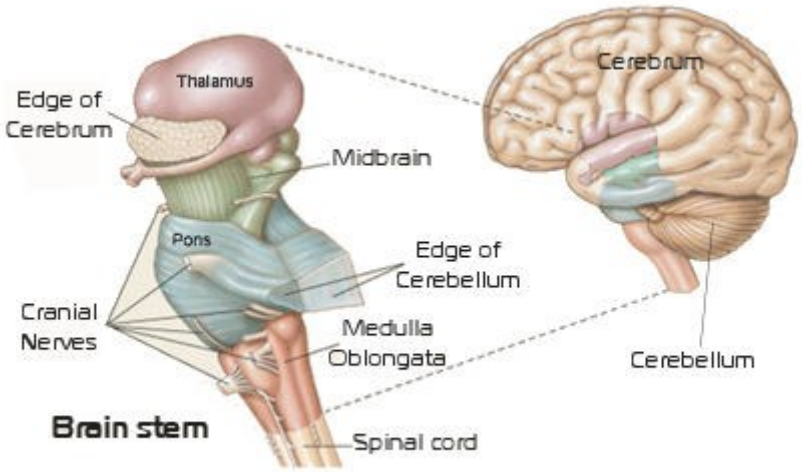

Figure 1: Brain Stem (Stroke Education, 2014)

Stem structures are the oldest and include the pons, medulla and midbrain, cerebellum, sometimes also referred to as cerebellum (Silverman & Rymer, 2009). This part of the brain contains the nucleus of cranial nerves, which are conducting the motor and sensory nerve pathways. This unit is located under the hemispheres, with a difficult access to it, compression of the brain stem quickly begins its displacement and compression of the trunk with edema, which are fatal for the patient (Aliberti, 2017).

2.2 Medical Statistics

In developed countries such as USA, Canada, Germany, the stroke is the third most common cause of death after coronary heart disease and cancer (Silverman & Rymer, 2009). The death rate from stroke is approximately 34.6%. Another 20% of people who have had poor

circulation, have severe disabilities and need constant care. 56% remain with constant disabilities (Aliberti, 2017).

2.2.1 The Risk of Stroke

The risk of a stroke significantly increases with the following factors (Silverman & Rymer, 2009):

- Male gender
- Age over 50 years
- Hypertension (manifested in the fact that the blood pressure periodically rises to the level of 160/90 mm Hg)
- Obesity
- Diabetes (uncontrolled high sugar in blood)
- Atherosclerosis (deposition of cholesterol on the walls of blood vessels)
- Smoking
- A stroke amongst a close relatives
- Oral contraceptives with high estrogen level

There are also some others, which are not too widespread (See Figure 2).

Figure 2: Risk Factors for Ischemic Stroke (Blue Latitude Health, 2015)

2.2.2 Symptoms of Stroke

Stem stroke develops suddenly. The following symptoms are observed most frequently:

- Speech disorder.

- Dizziness.
- Paleness or redness of the face.
- Sweating decrease, and then a sudden increase of body temperature.
- Intense pulse.
- High blood pressure.
- Violation of breathing and blood circulation.
-Violation of motor abilities.
-Violation of swallowing and speech.
- Facial asymmetry.
- Strabismus. (Aliberti, 2017)

Sometimes there is a “locked-in” syndrome (LIS). Since the transmission of impulses from the brain to the body is broken, paralysis affecting all limbs is also observed (Silverman & Rymer, 2009). However, the person does not start lacking intellectual abilities. Each patient can easily assess and understand everything what is happening. That is good, because such a person after the stroke can actively participate in the rehabilitation process of the organism (Aliberti, 2017).

The manifestation of some of these symptoms suggests that an urgent need to call an ambulance and see the doctor is of immense importance. At this moment it is important to diagnose and start treatment (Silverman & Rymer, 2009).

2.2.3 Classification of Stroke

Doctors recognize a small stroke or stroke with a reversible neurological deficit, which is diagnosed when clinical symptoms completely regress in the range from 2 days to 3 weeks (10-15% of patients).

By the end of the stroke it is classified as progressive stroke, which is diagnosed in case of increase of the degree of neurological deficit in time, and also complete (full) stroke - with the stabilization or regression of neurological disorders (Adams et al., 1993).

2.2.3.1 Etiopathogenic Subtypes of Ischemic Stroke

- Atherothrombotic stroke develops as a result of violation of the integrity of the atherosclerotic plaque with thrombus formation or embolus (arterio-arterial embolism) in atherosclerosis, as a rule, of major extracranial and intracranial arteries. Constitutes 50 - 55% of all ischemic strokes (Nentwich, Magauran, & Kahn, 2012).

- Cardio embolic stroke (20% of all ischemic strokes) develops due cardio cerebral embolism with heart disease. The source of embolic material are thrombotic mass in the cavities or valvular heart apparatus (Adams et al., 1993).

- Hemodynamic stroke (15% of ischemic strokes) develops against the background coarse stenosis (usually with more than 70% clearance) of large arteries of the head or neck, mostly atherosclerotic in nature, with a sharp fall in blood pressure (Petty et al., 2000).
- Rheological stroke (stroke by type of hemorheological micro-occlusions) (Constitutes 9% of all ischemic strokes) develops due to thrombosis of cerebral arteries resulting from hematological disorders (diseases) that lead to a hypercoagulable state and increase of blood viscosity (Petty et al., 2000).
    - Lacunary stroke (15 - 30% of all cases of ischemic stroke) is associated with occlusion of small cerebral vessels with the development of cerebral infarction of the foci (mainly in subcortical nuclei) having a diameter of 15 mm, and the so-called clinically lacunar syndrome. According to etiopathogenesis it is a kind of atherothrombotic subtype, but due to the peculiarities of clinic and treatment can be separated into a separate group (Nentwich, Magauran, & Kahn, 2012) (Figure 3)

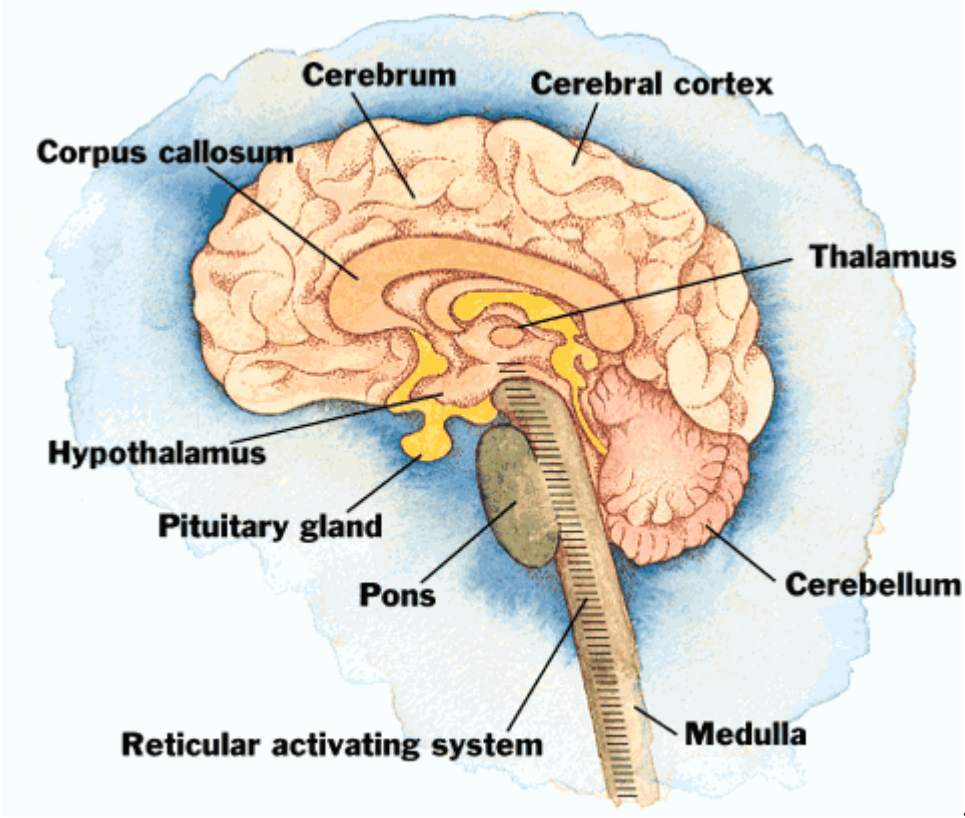

Figure 3: Structure of the Brain (Pendlebury, Giles & Rothwell, 2009)

2.2.3.2 According to the Affected Vascular Basin

Ischemic stroke in the carotid is found in (Nentwich, Magauran, & Kahn, 2012):

- The internal carotid artery.
- Anterior cerebral artery.
- Middle cerebral artery.

Ischemic stroke in the vertebrobasilar basin is found in

- The vertebral artery.
- Basilar artery.
- Myocardial cerebellum.
- The posterior cerebral artery.
- Thalamus.

2.2.3.3 In Accordance with the Perfusion Areas Involved

- Regional myocardial corresponding to stroke of the main arteries of the brain in the areas of their blood supply.
- Myocardial watershed areas - a heart attack in the areas of blood supply to the branches of major cerebral arteries or heart attack in the border (watershed) areas, at the junction of the blood supply to various areas of the arteries, usually of medium size (Silverman & Rymer, 2009).
- Lacunar infarction as a result of circulatory disorders in subcortical nuclei, internal capsule and the base of the brain bridge usually up to 15 mm in diameter (Adams et al., 1993).

2.2.4 Mechanical Point of View of the Stroke

Pain after a stroke or spinal injury is quite common. After a stroke, pain is usually localized in the left or right side of the body, it is caused by damage to a specific brain zone. Generally, pain is joint and neuropathic, often leading to paralysis (Figure 4). Joint pain appears more often, as the limbs of muscles and joints in them develop delayed onset muscle soreness from long dysfunction (Nentwich, Magauran, & Kahn, 2012). Neuropathic pain can occur anywhere, and the cause of this pain is nerve damage caused by traumatic brain injury, stroke, spinal cord trauma, or infection.

Figure 4: Aftereffect of a stroke in terms of muscles and joints (Facial Parlysis Institute, 2017)

2.2.5 Pathogenesis: the Main Provisions

The key point of the pathogenesis of ischemic stroke is local cerebral ischemia (a local anemia of brain tissue), develops during reduction of the cerebral perfusion below 18-22 ml per 100g / min (at a rate of 50-60 ml per 100g / min), which is a functional threshold (specifically, at rates below which the EEG in the respective area of the brain becomes flat). The perfusion rate of less than 8 to 10 ml per 100 g of brain tissue per minute is the threshold of irreversible changes – stroke threshold (Hsu, 1998).

2.2.5.1 Penumbra

If the duration of hypoperfusion is more than 6 - 8 min in zone of the stroke threshold, myocardial necrosis of brain tissue is formed - cerebral infarction, and the threshold in functional area is formed "ischemic penumbra" (Pic.5), in which blood flow of above a critical threshold creates irreversible changes (8-10 ml 100g / min), but a lower functional threshold, and nerve cells remain viable for a certain period of time. This area can be transformed into a stroke zone (brain tissue necrosis) as a result of secondary neuronal damage and remain intact in the event of restoration of blood flow (reperfusion). Basically, the formation of cerebral infarction occurs in the penumbra area within 3-6 hours. This time interval is called the "therapeutic window", i.e. 3-6 hours after the onset of the stroke is the time interval during which doctors can exert a therapeutic effect on the cells of the "ischemic penumbra" zone and prevent the development of necrosis (Kolominsky-Rabas et al., 2001).

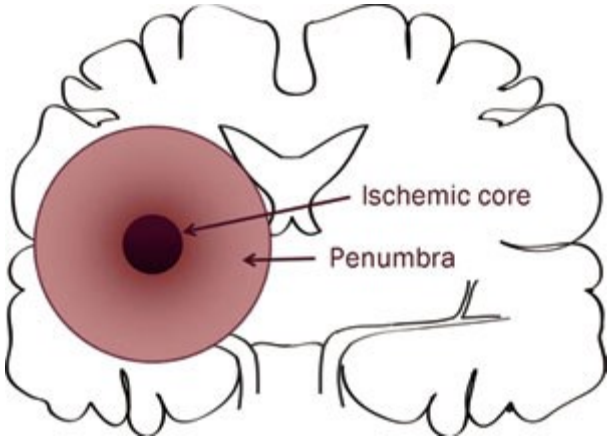

Figure 5: Penumbra (Coultrap et al., 2011)

2.2.5.2 Ischemic Brain Edema

During ischemia the anaerobic path splitting glucose and ATP formation is activated , which only partly compensates the energy needs of the brain and lead to the formation of lactic acid and lactate acidosis with impaired ion homeostasis cells with the subsequent release into the extracellular space neurotransmitters – glutamate, aspartate, activation of intracellular enzymes (lipase endonuclease) (Kolominsky-Rabas et al., 2001). These changes lead to the development of ischemic cerebral edema, the severity of which is in direct proportion to the size of cerebral infarction focus. With further progression the process is complicated by the development of brain swelling, edema - cerebral dislocation, sometimes with the addition of a hemorrhagic stroke impregnation (about 5% of cases) (Kolominsky-Rabas et al., 2001).

2.2.5.3 Hemorrhagic Transformation

Hemorrhagic transformation of cerebral infarction in 90 - 95% of the cases is associated with cardiogenic embolism. The key point is fibrinolysis embolus, resulting in reperfusion of the brain tissue in the stroke zone with the restoration of blood flow in the ischemic affected arteries and capillaries, and the subsequent development of diapedetic hemorrhages in the area of heart attack - hemorrhagic stroke (Petty et al., 2000).

In case of a favorable course of the disease doctors observe the resorption of necrotic tissue with the formation of glio mesodermal scar or cystic cavity (Petty et al., 2000).

2.2.6 Etiology and Pathogenesis of the Ischemic Stroke Pathogenic Subtypes:

2.2.6.1 Atherothrombotic Stroke

The primary causal factor is atherosclerosis of the intra- and extracerebral arteries (lesions of the aortic arch, brachiocephalic arteries or major intracranial arteries (arterio-arterial embolism)) (Adams et al., 1993). A stroke is caused by thrombosis or embolism due to thrombus detachment from the surface of the pitting, loosened atherosclerotic plaques in the stenotic lesions of the arteries.

Hemodynamic stroke

Hemodynamic infarction may be due to several reasons that lead to hypotension, and develops, usually on the background of coarse atherosclerotic stenosis of large arteries in the brain or neck (Adams et al., 1993). The sudden, rapid decline in blood pressure happens due to such reasons as:

- Orthostatic hypotension.
- Deep dream.
- Exercise stress.
- Cough.
- Hyperventilation.
- An overdose of antihypertensive drugs.
- Myocardial infarction.
- Cardiac arrhythmias.
- Hypovolemia.
- The decrease in cardiac output, which value is less than 3 liters.

The risk of a stroke increases directly according to the degree of arterial stenosis, and is highest when there is stenosis of 70% or more lumen of the artery (which corresponds to an average lumen diameter 2mm). When the average degree of stenosis is at 50-70% of myocardial possible, but the probability is much lower than in patients with severe stenosis (70-90%) and a pronounced (90%) stenosis. Stroke probability is more often localized in the border areas adjacent to the circulation (Hsu, 1998).

Rarer causes of the hemodynamic stroke:

- Anomalies of the arteries (kinking, kinks, increased length of the artery).
- Extravasal compression of the vertebral arteries by the pathologically altered cervical vertebrae.
- Fibromuscular dysplasia.

2.2.6.3 Stroke by Type of the Hemorheological Micro-occlusions

Happens because of a significant coagulation and rheological changes of blood diseases, due to the increase of indicators such as hematocrit, platelet aggregation and erythrocyte, viscose blood (Adams et al., 1993). Hematologic disorders that may lead to increased blood viscosity and hypercoagulability:

- Erythremia (in 10-20% of patients with an ischemic stroke).
- Thrombocythemia.
- Thrombocytopenic purpura.
- Thrombophilia.
- Deficiency of protein C, protein S, antithrombin III
- Sickle-cell anemia, thalassemia.
- Hyperviscosity syndrome.
- Polycythemia, thrombocytosis, leukocytosis.
- Different types dysproteinemia (macroglobulinemia, cryoglobulinemia, multiple myeloma).
- Education antiphospholipid antibodies, including lupus anticoagulant and anticardiolipin antibodies (antiphospholipid syndrome).
- Leukemia.
- The syndrome of disseminated intravascular coagulation (DIC syndrome).

2.2.7 The Main Causes of Ischemic Stroke

In 90 - 95% of cases of an ischemic stroke it is caused by atherosclerosis of arteries in the brain and neck lesions of cerebral arteries due to hypertension, diabetes or cardiac embolism (Hsu, 1998). The main etiological factors are (Kibble et al., 2013):

- Thrombosis of arterio-arterial embolism, arterial stenosis or occlusion of blood vessels due to atherosclerotic lesions of the aortic arch, brachiocephalic arteries or major intracranial artery (about 50% of all ischemic strokes) (Smith et al., 2008). Loosening, ulcerated atheromatous plaque emboli are the substrate, and dense plaques conglomerates stenotic lumen of the arteries and greatly reduce cerebral perfusion. Most embologenic atheromatous lesions are bifurcation of the carotid artery. Particularly adverse effect on the cerebral hemodynamics have multiple (echelon) stenosis (Hsu, 1998).

- subclavian steal syndrome is caused by stenosis or occlusion of the subclavian artery proximal to the point of origin of the vertebral artery, resulting in an regurgitation of vertebral artery for blood supply arms, and the blood in said vertebral artery is directed from the opposite vertebral, and basilar artery, resulting in they "steal" (Nentwich, Magauran, & Kahn, 2012). The syndrome most often detected by chance in a clinical or ultrasound, but may manifest weakness in the hand, pain and impaired sensitivity to it, transient symptoms of vertebrobasilar insufficiency (dizziness, seizures, double vision and blurred vision, unsteadiness when walking) (Smith et al., 2008). These symptoms are usually of short duration, occur spontaneously or when the load on the arm (Nentwich, Magauran, & Kahn, 2012).
- Defeat small intracranial arteries causing lacunar infarction (about 25% of the ischemic stroke) (Hsu, 1998).
- Cardiogenic embolism of a thrombus, usually located in the left atrium or left ventricle (about 20% of all ischemic strokes). For heart disease, having a high potential embologenic include atherosclerotic lesions of the mitral and / or aortic valve, left ventricle myocardial hypertrophy, intracardiac thrombi due to myocardial infarction (Smith et al., 2008).

Rarer causes:

- Stratification of the carotid and vertebral arteries (around 2% of cases of stroke).
- Vasculitis and arteritis (Takayasu's disease, Moya-Moya disease).
- Antiphospholipid syndrome.
- Venous thrombosis.
- Migraine.
- Fibromuscular dysplasia.
- Hereditary arteriopathy.
- AIDS.
- Neurosyphilis.
- Purulent meningitis.
- Hematologic Disorders.
- Side effects of oral contraceptives.
- Artificial heart valves and pacemakers, and the right-left shunt due to PFO.
- Deforming spondylosis of the cervical spine is a predisposing factor for the development of heart attacks in the vertebrobasilar basin-byazilyarnom by

compression of the vertebral artery where it passes in the holes of the transverse processes of the cervical vertebrae, as well as on the atlanto-occipital area.

- Dissection (separation) of the aortic arch and cerebral arteries.
- Pathological tortuosity of the main arteries of the head and neck.
- Compression or permanent fixation of the vertebral arteries in congenital anomalies craniovertebral (Klippel-Feil syndrome, a syndrome of Arnold Chiari, Kimmerle anomaly).
- Cryptogenic stroke, the cause of which is yet not possible to find (Nentwich, Magauran, & Kahn, 2012).

2.2.8 Difficulties

Among the stroke survivors half of the people are prone to have a second episode within five years.

The fate of a particular patient depends on the location and size of ischemic hearth, state anastomoses and cerebrovascular comorbidity. It is difficult to make an individual prognosis, even after the most detailed examination. If the stroke zone is localized in the pyramidal tract, movement disorder will be more pronounced, if the cortical speech areas of the Brocchi and Wernicke are damaged, then speech disorders are present (Grau et al., 2001).

However, there are general trends that have statistical significance. For example, it is known that some factors aggravate forecast:

Location. It is known that city dwellers suffer from stroke more often than those in the rural areas: disease rate is respectively 3 and 1.9 per 1,000 population. However, mortality from stroke over the region is higher than in the city, which emphasizes the role of the timely provision of skilled care.

Repeated strokes. In 3/4 cases stroke develops only in the first case, 25% are prone to recurrence. In order to predict the secondary stroke a sufficiently accurate risk assessment scale has been developed, but the forecast is much harder.

Elderly age. In half the cases the disease develops at the age of 70 years and older, mortality in these patients is also significantly higher than in the general population. The forecast recovery of speech and complex movements are usually also much more difficult (Aliberti, 2017).

Changes in personality. In the event of any stroke occur cognitive and emotional-volitional disorders. According to its degree of development and reverse speed one can also judge the prognosis of the disease (Tauseef, Fahiem, & Farhan, 2015).

The influence of such factors on the positive outcome of the disease, as the earliest medical care, early activation and early recovery activities, as well as the spontaneous recovery of lost functions, such as speech and motor (Aliberti, 2017). For a more accurate prediction of the risk assessment doctors developed individual scales. Unfortunately, they are not able to predict the first episode of stroke. The most common cause of ischemia is embolism of brain arteries (Aiyagari & Gorelick, 2016). Warn detachment of plaque or a blood clot and blockage of the vessel medication is almost impossible to predict how and at what point it happens (Grau et al., 2001).

Methods of assessing the cumulative risk factors show good results in terms of prevention of secondary episodes. It is enough to give an accurate prediction of stroke scale AVSD patients who have already taken up transient ischemic attack (TIA). It includes criteria such as age, blood pressure, clinical symptoms and their duration, as well as the presence or absence of diabetes (Grau et al., 2001).

2.2.9 Classification of Post-Stroke Effects

In terms of changes doctors distinguish:

- focal (hypoxia caused in certain areas of the brain);
- cerebral (brain universal reaction in the form of edema);
- meningeal (with involvement of the meninges);
- Extracerebral disorder (changes in other organs).

Only focal symptoms signalize about the stroke. Ischemic process is always characterized by its predominance over other symptoms. There are times when there are isolated general-meningeal or brain disorders. People with a high risk of the disease indication may have acute circulatory disorders (Grau et al., 2001).

Depending on the stage of the stroke, the consequences can be

- Earlier, developed in the acute phase (up to 5 days) and the high risk phase (up to 21st day);
- Later, appeared in the early (up to 6 months) or late (up to 2 years) recovery period;
- Persistent residual symptoms, which in the event of larger strokes are stored for more than 2 years.

2.3 Focal Consequences

Alopecia symptoms depend entirely on the location of ischemic hearth. The most common are the consequences of a violation of the motor and speech function, the most formidable - swallowing disorders, more rarely - visual impairment.

Recovering from a stroke requires a great exertion on the part of the patient, and from his relatives, so negative personality changes dramatically manifested in the rehabilitation period are regarded as the most psychologically difficult.

2.3.1 Disturbances of Motor Activity

Disorders in the form of paresis (attenuation amount of voluntary movements) and paralysis (their complete cessation) by the end of the acute period are observed in 80-90% of patients. At 2/3 prevalent movement disorder mild to moderate with one hand (one-sided hemiparesis). Hemiparesis is usually combined with sensitivity, speech or vision disorders. Very rarely the motor function is an isolated violation (Tauseef, Fahiem, & Farhan, 2015). The patient may even experience dysmotor function, muscles paresis, paralysis, weakness and instability.

The scope and strength of movements usually begin to recover as early as the first week after stroke. A full recovery takes about six months, and complex motor skills are formed again in 1-2 years. The forecast recovery of motor function worsens, if there are no positive developments during the first month after stroke. On the contrary, the sooner recovery of spontaneous movements begins, the more optimistic the outlook (Grau et al., 2001).

2.3.2 Trophic Disorders

During the second month of the disease 15% of patients develop arthropathy, which are diseases of the joints due to the violation of their trophism. Most changes occur in the joints of the upper limb on the affected side: the fingers, wrist and elbow. Sometimes, similar symptoms occur in the joints of the lower limb. Due to severe pain movement in those joints can be severely restricted, which contributes to the formation of future contractures. Sometimes muscular atrophy, increased tendency to bedsores are formed (Grau et al., 2001).

2.3.3 Speech Disorders

Disorders of speech are found in almost half of patients with a stroke, and combined with motion impairments. They manifest themselves in the form of:

- dysarthria - pronunciation and articulation disorder due to limited mobility of the organs of speech;
- Aphasia - speech disorder in the form of "forgetting" objects names, violations of understanding words or complex sentences, etc.
- Alphabetic agnosia, or disturbance of recognition of written speech, difficulty in reading and writing.

Initial speech recovery occurs in the first six months. In order to return to the initial pre-stroke level of communication the patient may require participation in rehabilitation activities for 2-3 years after the stroke (Aiyagari & Gorelick, 2016).

2.3.4 Bulbar and Pseudobulbar Palsy

When localizing the bulbar ischemia in the department of brain stem damage in the cranial nuclei, responsible for the process of swallowing, occurs. Dysphagia (swallowing disorders) is one of the most dangerous consequences of stroke. Food or liquid can fall into the esophagus, and airways, causing pneumonia or asphyxia. If the patient stops eating due to swallowing disorders, degenerative disorders arise (Pendlebury, Giles, & Rothwell, 2009).

In addition to dysphagia, bulbar syndrome occur when the following violations are observed:

- dysarthria;
- dysphonia - voice changes in the form of a nasal or hoarseness;
- loss of gag reflex;
- sagging on one side of the palatine curtains;
- Salivation.

Pseudobulbar palsy occurs during the localization of ischemic hearth in the supranuclear structures in the brain stem. In addition to dysphagia, dysarthria and dysphonia, it can be manifested due to violent laughter or crying, increased reflexes with the pharynx and soft palate (Pendlebury, Giles, & Rothwell, 2009).

2.3.5 Visual Disorders

If the stroke affects visual pathways may arise:

- scotoma - visual field loss;
- hemianopsia - bilateral blindness like or different halves of the visual field (right and left, or internal and external);
- amaurosis - partial or complete blindness due to lesions of the optic nerve or retina;
- Photopsias - flickering moving spots or dots ("flies") before the eyes of the body in the absence of eye disease.

2.3.6 Personality Changes

Focal brain lesions may be accompanied by changes in cognitive mental functions. Often these violations are observed in:

- the difficulty of orientation in a changing environment;
- decreased attention;
- slowing of thought processes;
- significant memory impairment;
- Asthenic-depressive syndrome.

Post-stroke depression is often taken aback by the relatives of the patient, who are not ready for such consequences. However, this disorder, as well as others can be treated. Sometimes there are unexplainable mood swings, possible aggression, negativism, apathy (Nentwich, Magauran, & Kahn, 2012).

In 7-15% of patients as a result of a stroke appears epilepsy consequences.

2.4 Cerebral Disorders

The intensity of brain effects can range from a sense of "fog" in the head up to a coma. As a result of cerebral edema appear headache, nausea, vomiting. The patient can be disturbed by pain along the spinal nerve roots (Silverman & Rymer, 2009).

2.5 Meningeal Disorders

Meningeal symptoms appear sometime after the stroke, usually during the 2-3rd week, with involvement of the meninges. The most commonly defined is the strain of the back of the neck muscles, and positive symptoms of Kernig and Brudzinski (Greer, 2007).

2.6 Extracerebral Disorder

After heavy strokes at the end of the first and beginning of the second week there is multiple organ dysfunction syndrome, which determines the outcome of the disease. This term defines the failure of 2 or more of the functional systems of the body to maintain a state of homeostasis in critical situations (Aliberti, 2017).

In all patients, there is acute impairment of the functioning of the respiratory system, among 2/3 - cardiovascular system, 60% - of the mucous of the gastrointestinal tract, 46% - kidney (Greer, 2007).

The cause of deaths after stroke are the following extracerebral disorder:

- pulmonary embolism - in 20% of cases
- pneumonia due to dysphagia - 5%;
- acute myocardial infarction - in 4%;
- Acute renal failure - 4%.

2.7 Persistent Residual Effects

In addition to the restoration of impaired functions, secondary complications may develop after stroke. In connection with the forced prolonged rest many may develop limb thrombophlebitis, pulmonary embolism, congestive processes in the lungs, pressure sores (Ghaffar, 2014).

Speech disorders may lead to a "telegraphic" style of communication (Pendlebury, Giles, & Rothwell, 2009).

Against the background of the recovery volume and force of movement, spasticity is a common complication. If any movement of the joints of the patient has to overcome muscle tension. The reason for this is the disinhibition of the tonic stretch reflex (Aliberti, 2017). Spastic muscle tone impedes rehabilitation programs, and promotes the formation of persistent contractures (Pendlebury, Giles, & Rothwell, 2009).

Muscular dystonia that occurs after stroke is characterized by the following features:

- increases in passive muscle tension;
- increases the amplification rate movements;
- it depends on the nature and intensity of exercise, the final position;
- Its degree varies under the influence of external and internal factors during the day.

Besides spasticity, disorders of motor activity may be associated with the development of secondary atrophy of muscle tissue. Thus, the contractures are the most common effects of stroke.

Dystonia of the spine muscles may be accompanied by complications in the form of radicular syndrome, pain in the thoracic or lumbar spine (Silverman & Rymer, 2009).

In the early recovery period 60-80% of patients have complications in the form of drops. Their risk increases for the following offenses (Aliberti, 2017):

- coordination and balance;
- muscle-joint senses;
- view;
- attention deficit;
- hypotension muscles paretic limb;
- with a total of fatigue, which can be enhanced under the influence of certain drugs;
- Orthostatic hypotension - a sharp drop in pressure during the transition from the horizontal state to the vertical.

Ischemic stroke prognosis is influenced by many factors, thus even survival is already regarded as a good outcome.

2.8 Prognosis of the Ischemic Stroke

2.8.1 Speech Violation

Ischemic stroke may lead to speech disorders, which occur in approximately 30% of patients. Dysarthria is expressed in a quiet, unclear, slurred speech, but with the help of speech therapy can be adjusted. However, it does not help patients with the Locked-In syndrome because they cannot speak or move any part of the body (Ovbiagele & Turan, 2016). Therefore, the outlook for the recovery of patients who are diagnosed with "ischemic stroke with speech disorders" is unfavorable.

2.8.2 Violation of Swallowing

Violation of swallowing functions is the most common symptom suggesting that there was a stroke in the brain stem. Such a violation is observed in most of the patients and 65% of all cases. The forecast for the partial or complete recovery of patients with dysphagia is uncertain (Ovbiagele & Turan, 2016). Therapists do what is possible with the help of special techniques to teach the patient to swallow starting with soft, mashed food.

2.8.3 Violation of Motor Function of Limbs

In the event of an ischemic stroke control of limb movements becomes impaired, and they move spontaneously. The motor function is at its lowest, muscles experience paresis, paralysis, weakness and instability. In the first two or three months after the disease, the restoration of the motor function will have a positive outlook, but further dynamics of recovery decreases (Ovbiagele & Turan, 2016). In some cases, recovery is possible within one year of onset. However, after a year further recovery is extremely rare.

2.8.4 Incoordination

Vertigo is an early sign, signaling that perhaps there was an ischemic stroke. It usually disappears quickly in the process of treatment and rehabilitation (Ovbiagele & Turan, 2016). However, the forecast for the full deliverance from vertigo is uncertain, as it depends on the degree of brain damage (Greer, 2007).

2.8.5 Respiratory Failure

When there is a stroke of the brainstem which affects the respiratory center, people with such a diagnosis cannot breathe on their own. S to the future, the forecast is disappointing: it is possible that the patient will be completely dependent on the artificial ventilation system. If the respiratory center of the brain is not destroyed completely, then these patients will experience short periods of breathing cessation during sleep, the so-called sleep apnea. During wakefulness slow breathing can be observed (Greer, 2007).

2.8.6 Hemodynamic Instability

The ischemic stroke of the brain stem can impair the cardiovascular system. Such violations may occur through increased blood pressure and heart palpitations (Greer, 2007). If the heart rate is reduced, it is a poor prognosis, as then the doctors can talk of extremely grave condition of the patient in such a case the stroke can be fatal.

2.8.7 Unstable Thermoregulation

The ischemic stroke of the stem is sometimes accompanied by a violation of thermoregulation, which insinuates the plight of the patient condition. It usually occurs in the

form of a sharp rise in temperature up to 102.2 ˚F degrees or higher in the very first hours from the beginning of the disease. This situation is poorly treated (Greer, 2007). If the temperature becomes decreased, the prognosis is not comforting, as it is evidence of an imminently complete loss of the brain stem cells.

2.8.8 Visual Impairment

The ischemic stroke in the brain stem is often reflected in the vision. If there is damage to the control center of eye movement, which is also located in the brain stem, a spontaneous movement of one or both eyes can be observed. It may result in an impaired ability to focus on something, the possibility of diversion of eyes to the side, upways, or even the development of strabismus (Ovbiagele & Turan, 2016).

The aftereffects of an ischemic stroke are quite complex and it takes time to recover from them. Therefore, the brain-stem stroke treatment prognosis depends largely on how quickly the treatment began and the degree of brain damage (Figure 6) (Aiyagari & Gorelick 2016). If the patient has experienced ischemic cerebral stroke in 60% of cases this is followed by death within the first months. Of all the people, who experienced ischemic stroke of the polls only 20% will be able to fully restore the functions of their body. During the first thirty days from 8 to 82% of patients die, depending on the severity of the stroke. Again, it all depends on the provision of skilled care and the extent of brain damage (Aiyagari & Gorelick 2016).

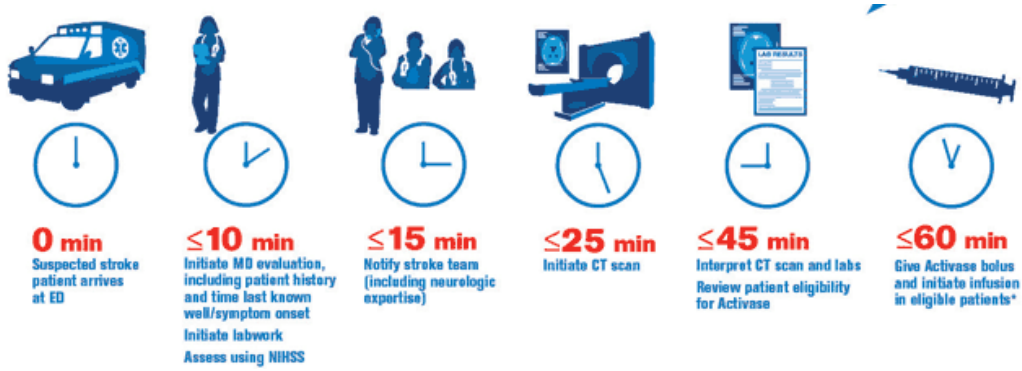

Figure 6: Door to treatment (Vitorino, 2015)

The most dangerous factor of the disease is that there is a possibility of recurrence in the first few months after the first case occurred. Exacerbations are associated with the brain condition in the latter case more serious than the first, so after the second stroke the mortality rate is almost 100%. Depending on the type of stroke and how quickly the patient was provided care with, the doctor can make an actual prognosis about the recovery of the patient (Aiyagari & Gorelick 2016). The ischemic stroke often has irreversible consequences flowing quite rapidly and causing injuries that lead to death or disability. Full recovery from this type of stroke is almost impossible (Deaver, 2015).

Realizing the dire consequences of the strokes, and the difficulty of undergoing rehabilitation it is worth the extra effort to pay attention to the close relatives of the patient, as well as the person himself, who is at risk, were able to detect the symptoms of a stroke at an early stage and promptly seek medical attention (Aiyagari & Gorelick 2016).

2.8.9 Diagnosing a Stroke

In order to diagnose a patient with a "stroke", the doctor must take into account the presence of the patient's risk factors and any concomitant diseases, as well as the conclusion from the neurologist. Research to be carried out (Greer, 2007):

- General and biochemical blood test (it should include an analysis of the level of fats and cholesterol in the blood)
- Urine analysis
- Research of blood clotting (coagulation)
- Eelectrocardiogram
- Doppler ultrasonic of blood vessels of the head and neck
- CT (computed tomography) or MRI (magnetic resonance tomography); if it is impossible to make data analysis, sampling is taken of cerebrospinal fluid (lumbar puncture) (Kummer & Back, 2011)
- Consult a physician or ophthalmologist

2.9 Stroke Treatment

For the treatment of ischemic stroke, doctors must quickly restore blood flow to the brain.

2.9.1 Treatment with Drugs

Treatment with blood thinners must start within 4.5 hours - and the sooner, the better. This improves the chances of survival and reduces the complications of the stroke. For this purpose (Deaver, 2015):

- **Aspirin.** Aspirin is the most proven effective medication for the immediate treatment of ischemic stroke, reducing the likelihood of stroke recurrence. The dose of the drug may vary.

Other drugs, blood thinners, such as warfarin (Coumadin) or heparin may also be used, but not for emergency treatment.

2.9.2 The Introduction of Tissue Plasminogen Activator (tPA)

For some patients with ischemic stroke of great effectiveness would be the early administration (within 4.5 hours from the onset) of tissue plasminogen activator (tPA), which leads to clot dissolution and restoration of blood flow in the blocked artery (Brott et al., 1987).

In the treatment of ischemic stroke, it is often necessary to carry out procedures that must be performed as quickly as possible. This means to use:

- The use of tissue plasminogen activator (tPA), with direct delivery to the brain. Doctors can use catheters for introduction of the drug into the brain (Brott et al., 1987).
- Mechanical removal of the clot. Doctors also use a catheter to maneuver in the brain with the mechanical removal of thrombus (Yamaguchi et al., 1995).

2.9.3 Other Procedures

To reduce the risk of recurrent stroke the doctor may recommend a procedure to open the plaque of the narrowed arteries plaque. This may include (Kasner & Gorelick, 2004):

- **Carotid endarterectomy**
  In this procedure, the surgeon removes the plaque blocking the carotid arteries in the neck. The blocked artery is opened, and the plaque is removed. The procedure can reduce the risk of ischemic stroke. However, carotid endarterectomy itself can also cause a stroke or heart attack, contributing to the formation of a blood clot. To reduce the risk of stroke, doctors use special filters used at strategic points of the blood flow (Lapchak & Zhang, 2017).
- **Angioplasty and stenting**
  Angioplasty is another method of expanding arteries leading to the brain, usually the carotid artery. In this procedure a balloon catheter is used, when blown up enough results in the expansion and contraction of arterial plaques (Lapchak & Zhang, 2017). Most often doctors use stenting for the narrowed arteries inserting special sections of metal tubes (stents), which remain in the artery, preventing its restriction (Yamaguchi et al., 1995). Installation of the stent in the artery of the brain (intracranial stenting) is similar to carotid stenting.

2.9.4 Rehabilitaion and Physiotheraputic Intervension

The intervention of the physiotherapist after the ischemic stroke, played an important role to restore the functions and the abilities of the patient, a physiotherapist applies different kind of procedures, starting with positioning, deep vein thrombosis prevention, Verticalization, functional exercises, Proprioceptive neuromuscular facilitation, Dynamic neuromuscular stabilisation, sensomotoric stimulation, with fine motor exercises together with the ergo therapist. Immediately after surviving from ischemic stroke, physiotherapist intervention must be applies to prevent any complications which might make it hard for the patient to regain the ability soon enough or even worsen his state. (Kolar, P et al.2013).

Due to the high expectance of the pulmonary embolism or even pneumonia therefore we must ensure that the airways are clear and prevent any kind of aspiration. Also by helping the patient secretes and hygiene the lungs throughout some breathing exercises which has good effect to improve the airway clearance and ventilation. Also it helps him to improve endurance and general exercises tolerance. Moreover there is high risk of deep vein thrombosis (DVT) in the first days after the stroke, which we must keep an eye on it by providing the patient a limbs stocking, or elastic bandages, we ask them elevation of the limbs, anti-coagulant therapy and they must keep hydration. Furthermore, (Cameron, M. H., & Monroe, L. G. 2007).

Positioning in acute phase and rarely in sub-acute phase is important to prevent deformities, contractures ROM restriction, decubitus, pain. Patients after stroke, depends on their situation and ability can be positioned in three types of positions (supine -prone - side-laying) 24 hours long (changing the position every 2 hours) Due to spasticity development during the sub-acute phase the physiotherapist task is prevent them from worsening and decrease the spasticity as possible, a prolong stretching has great effect on reducing the spasticity which usually accrues in the hand flexors and leg extensors.
A stretching between 20-30 seconds shows a clear benefits on the targeted muscles, also the bracing for the lower extremities is used to restore the mobility of the paretic limbs, and it also used for the (dropped foot) with impaired dorsal flexion of the ankle and prevents the planter flexors spasticity. (Kolar, P et al.2013).

Verticalization is considered to be the bridge to self-dependency, physiotherapist helps and gives the instruction to the patient how to verticalize from laying to sitting or from sitting to standing or even transfer to wheelchair depends on their situation and vice-versa. They also

has to be instructed on how to use the healthy limb to carry the affected limb during the verticalization depends on patient ability the therapist helps the patient to verticalize. Also in setting position his hands in contact with the bed, we ask him to try half standing by pushing his hands towards the bed 15 times, that will improve the stability of the shoulder and strengthen his paretic arm also it has an effect to stretch his wrist and fingers flexors which commonly will develop a spasticity. (Cameron, M. H., & Monroe, L. G. 2007).

Patient after stroke usually suffer from lack of balance and stability therefore, the physiotherapist goal is to regain balance and stability of the patient, starting from easy levels of balance exercises which are listed below; in sitting positions, while the patient seated we make sure to establish the symmetries alignment of trunk, shoulder and head as possible and pelvis in natural position. For facilitation pelvis anterior tilt, the therapist hold the patient's trunk and pulls it slightly forward and up. For facilitation the pelvis posterior tilt the same technique applied but this time we pulls the trunk backward and down. . (Cameron, M. H., & Monroe, L. G. 2007).

In order to facilitate his balance therapist stand in front of the patient with an object and ask him to grab the object from many positions, focusing on the affected arm we also encouraging him to grab the object crossing the midline, it also facilitate his wrist and finger extensors and flexors, this exercises is working together with his vision stimuli which will improve his coordination when following the objects to grab it. (Cameron, M. H., & Monroe, L. G. 2007).

We also work with the foot in setting position while the foot in contact with the floor, to Reach the arch of the foot (toes to heel) asking him draw the toes to the heel without flexing the toes, by making the three point contact (medial and lateral metatarsal – heel) and then gradually increase the levels according to his improvement. Moreover the physiotherapist main goal is to improve the ADL, patient will focus on the tasks which he will finds it hard for him, patient will try to repeating the task many times as an exercise along with ergotherpaist exercises which he will perform in the ergotherapy room, repeating these exercise will definitely improve his fine motor skills. ADL exercises are mentioned in great details below at the day by day therapy. (Kolar, P et al.2013).

Modalities are used depends on the patient situations and current state, mostly (FES) functional electrical stimulation are highly used to speed up the motor functions, reducing

pain, it also used to decree the shoulder sub-luxation. It has an effect to facilitate and improve the dorsal flexion of the ankle (drooped foot) which is the common symptoms in the hemiplegic person, the principle of this devise is basically sending a stimulus to the peroneal nerve to contract the muscles which dorsal flex the foot. New devise called (WalkAid) Which my supervisor recommended to use on the patient to restore his ability of walking by applying electrical current to common peroneal nerve with implanted Electrodes to trigger muscles contractions and improve the balance and gait. In the case of the (FES) application to foot drop, the electrical stimulation is applied to the common peroneal nerve, inforce muscles controlled by both the deep and superficial peroneal nerves, and resulting in dorsiflexion and eversion of the ankle. The stimulation of the nerve works during the gait cycle, so that it stimulates the nerve during the swing phase and stops during the stance phase. (Cameron, M. H., & Monroe, L. G. 2007).

PNF (proprioceptive neuromuscular facilitation stretching), which was developed by Herman Kabat, the principle is more or less a set of stretching or strengthen by facilitating the muscles using the proprioceptive system through its feedback, PNF uses many technique depends on the goal of the therapy. This technique uses various diagonals to target a specific muscles or muscles group. This is some of the techniques which are used to reach the gaol of the therapy. Contract Relax, Hold Relax, Repeated Contraction, slow reversal, and Rhythmic Irritation. Depending on the goal of the therapy, we can use PNF for stretching, also we can use it for strengthen g e.g. (Repeated Contraction) is used to facilitate and strength the muscles (Kolar, P et al.2013).

Seating Balance:

After a stroke the patient has difficulty in sitting properly, therefore extra stretching and pulling at one's limbs is advised. (Figure 7)

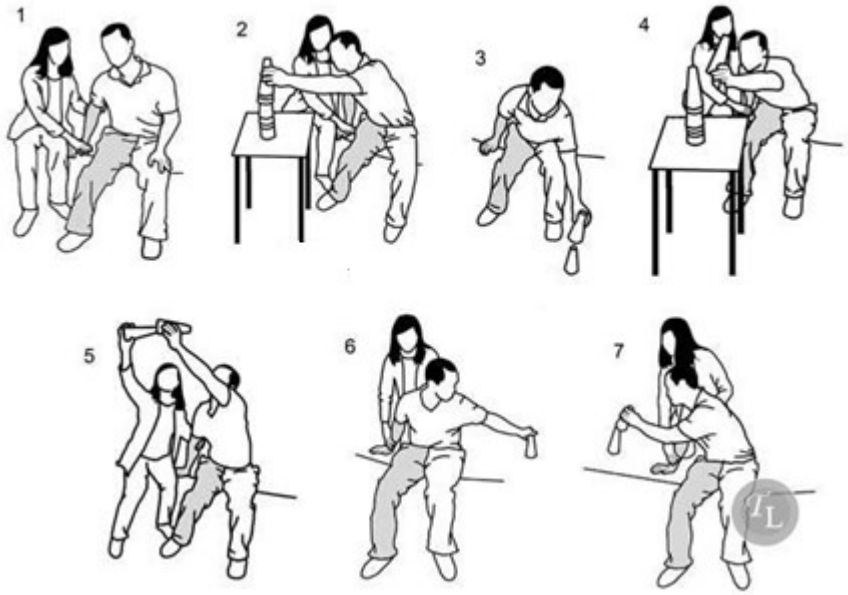

Figure 7: Seating Balance Exercises (Saebo, 2015)

Leg Exercises:

In order to train the muscles of the legs after a stroke, due to feeling of paralysis or muscle tension it is best to use the following exercise in home conditions. (Figure 8).

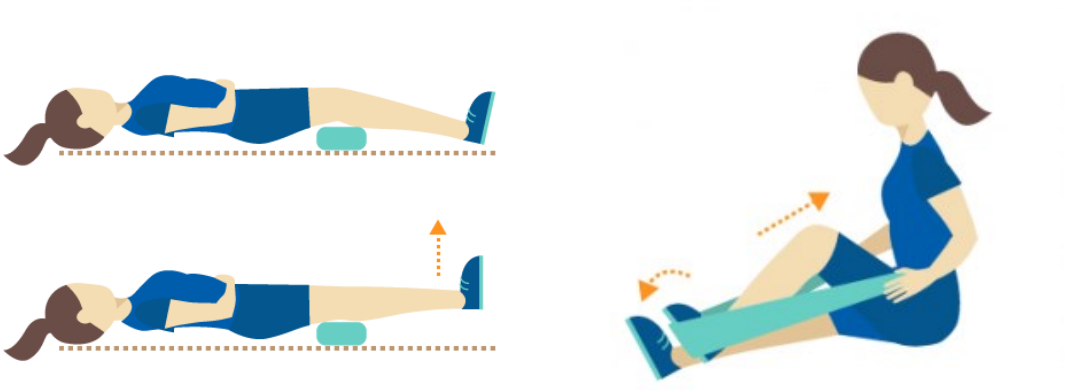

Figure 8: Leg exercises (Saebo, 2015)

Arms, Hands and Fingers Exercises:

It is important to work out on the arms, hands and fingers to speed up the rehabilitation and regaining of one's functionality. (Figure 9).

Figure 9: Arms, Hands and Fingers (Saebo, 2015)

Balance:

Not only are the muscles of importance, but also the feeling of balance that is always lost after not "using the body for some time (Figure 10)

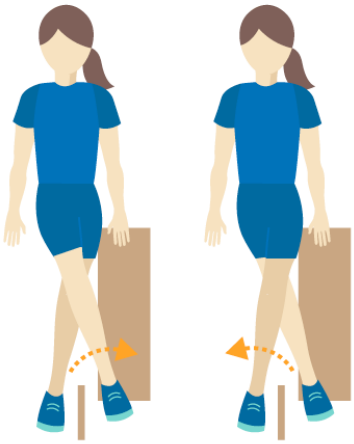

Figure 10: Balance Learning (Saebo, 2015)

Functional Core Exercise for the Waist

All of the above would be impossible to perform without a strong muscle tension in the area of the waist (Figure 11).

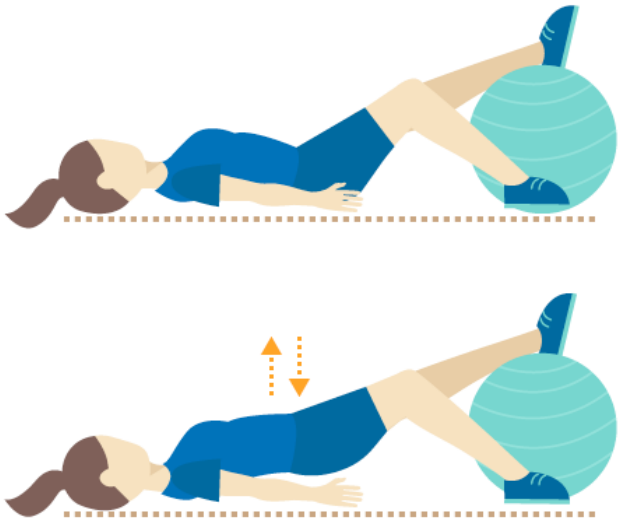

Figure 11: Strengthening Waist Muscles (Saebo, 2015)

3. Special PartCase Study

3.1 Methodology:

I have completed my clinical demonstration with patient in sub-acute neurology department after cerebrovascular accident (CVA). My work was held in Kladno Oblastní Nemocnice. Started on Monday 30.1.2017 ended on 10.2.2017. duration of my shift was 8 hours. My work was under the constant supervision of Bc. Tomas Modlinger.

Therapy sessions were devised in 2 sessions (Morning session - afternoon session). the sessions of the first week was held in the neurology department, the second week the patient was transferred to the rehabilitation department where our sessions took place there.Therapy sessions duration was maximum one hour according to the present state of the patient.
I declare that all my clinical work (Examination - Therapy) was implemented according to the knowledge which i gained at the University of Physical Education and Sport.physiotherapy department.

I confirmed that there was no invasive method applied. I ensure that the patient was informed about my thesis work and he agreed to be my case study. I also have the permission to use his data and his anamnesis, patient allowed me to purplish my thesis with respecting that all his personal data will be anonymous. I attached below in the supplement both the informed Consent and the Approval by the ethics committee.

3.2 Anamnesis

Examined Person: M.P

Gender: Male

Year: 1963

Diagnosis: Ischemic Cerebrovascular Accident (Stroke) in the Pons.

3.2.1 Status Praesens

a) **Objective:** on 2.2.2017 the patient was in the sub-acute neurology department after an ischemic stroke in the pons which was on 21.1.2017. Patient was laying on the bed, he stopped using the bladder catheterization on 1.2.2017 and using urinal bottle instead, placed on the right side of the bed. His lack of independence is clearly seen on the first sight, his laying position was supine, moving from laying to sitting, or sitting to standing and vies-versa and transferring from the bed was a challenge for him, also (the table was placed on right side of the bed) patient medication were giving him through an intravenous tube supervised by nurses stuff. Assistive aid such as a walker with four legs were brought to his room every day before taking him for a walk. He needs an external assistance for most of his basic daily activity he is right handed.

b) **Subjective:** patient suffering from high blood pressure (Hypertension), he claimed that he's feeling sad because of his left side of body is not-function anymore, although he has no pain as he mentioned, only fatigue at night from walking and exercising.

   Height: 185 cm.

   Wight: 80 kg.

   BMI: 23.4

   Blood pressure: 132/78 mm Hg.

   Heart rate: 78 beats/min.

3.2.2 Previous Rehabilitation

Patient had a medial meniscus tear of the right knee 20 years ago, he received a conservative physical therapy for 2 weeks and continue the self-rehabilitation at home doing some exercises instructed by the physiotherapist.

Also he was hospitalized in Oblastní Nemocnice Kladno from 21.1.2017 after the stroke attack. In the neurological department he underwent some positioning exercises, active exercises for thromboembolic prevention. Also passive stretching especially on the affected side.

3.2.3 Pharmacological Anamnesis

1. KCL 500ng tbl
2. Rosucard 40mg tbl
3. Ataralgin tbl dp, pri cefalee 1 tbl min an 8h max 3.
4. Triplixam 10 mg/ 2.5/10 mg
5. ANOPYRIN 100mg tbl
6. Betaloc ZOC 50mg tbl
7. APO-Panto 40mg
8. Magnesii lactici

3.2.4 Allergies
Dust.

3.2.5 Abuses
Drinks alcohol occasionally

2.2.6 Family Anamnesis
Parents are dead, he has 2 daughters.

3.2.7 Social Anamnesis
He lives with his girlfriend in flat, on the third floor, there is elevator.

3.2.8 Occupational Anamnesis
He's retired, but he used to work in paper shop.

3.2.9 Hobbies
He reads books, walking, bicycling

3.2.10 Exceprt from patient's health care file

On 21.1.2107 patient was brought by his girlfriend to the emergency room of Oblastní Nemocnice Kladno at 2 am. After suffering from numbness and weakness on the left side with headache. Patient underwent a CT scan (computed tomographic) which confirms the ischemic stroke. The radiologist had to stop the MRI after 2 minutes of the procedure, due to the panic attack the patient refused to continue the exam, and they plan to make the MRI after one week if he agrees. One week later he underwent the MRI, the radiologist still not sure what is the reason of the ischemia, it could be a tumour, and furthermore, they scheduled another MRI after 6 weeks to check it again.

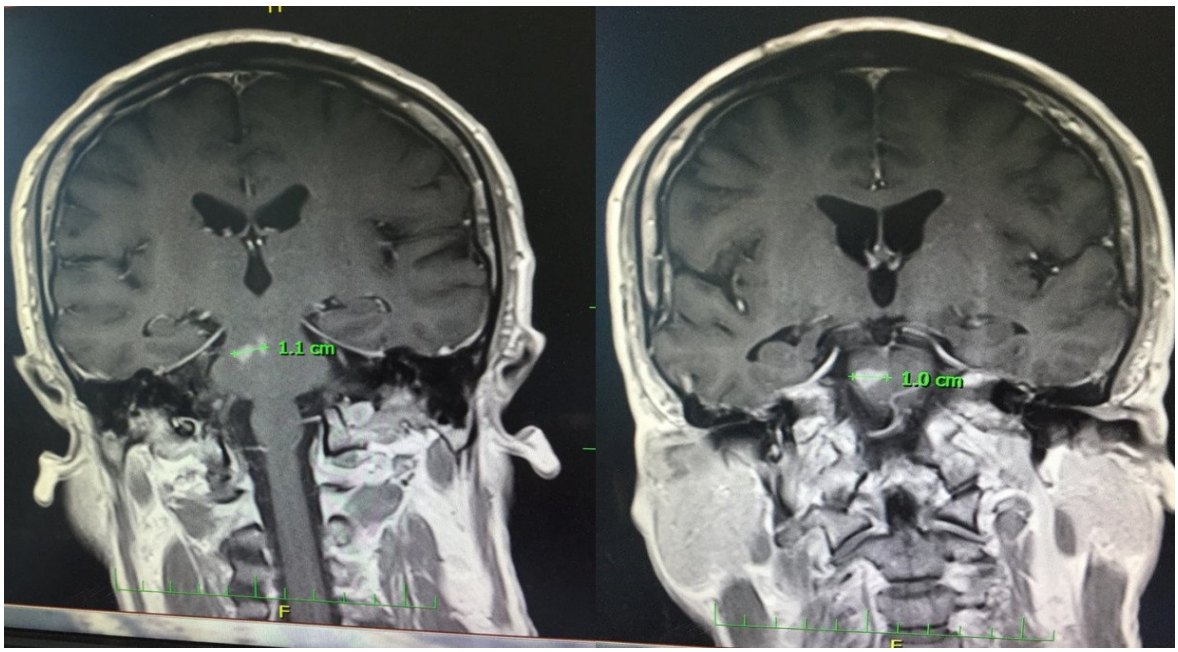

Figure 12 : MRI shows 2 layer sections of the brain, a blood clot (Ischemia) in the basilar artery are shown in both layer sections which affected the right pons.

3.2.11 RHB Indications

Due the patient current state we should be focusing on improving the self-sufficiency and dependency of the patient step by step, starting improve his verticalization from laying to sitting also sitting to standing and vies-versa. Facilitate the muscles which considered to be week. Moreover we need to mobilize the joints which are blocked. Core exercises will be in consideration as well. Increase the range of motion of the affected joints. Walking exercise and correcting and type of faulty pattern which might be seen in his current state. Stability improvement must be included. Restore the ability of the basic daily activities and the functions of his affected side as soon as possible with the intervention of the ergotherapist, also as a team work a speech therapist will help the patient to restore his facial muscles tone and any kind of speech disorders or difficulties (logopedy)

3.2.12 Differential Balance

As we mentioned already that the patient is in sub-acute phase after been diagnosed with an ischemic stroke on 21.1.2017. after knowing the diagnosis of the patient we can be expecting various of problems, firstly weakness or even paralysis in one side of the body, the seriousness depend on how much the brain tissue was affected, that could reduce self-dependency of the patient, also its common to see muscles spasticity, hypertrophy, of the affected limp, moreover

there will be a lack superficial and deep sensation and hyperreflexia of the deep tendon reflexes in the affected side, joints restriction will be present after this kind of diagnosis, lack of coordination as also a common symptom, with poor stabilization since of the side of the body is affected. Last but not least a high expectation that the patient ADL will be affected as well.

3.3 Initial kineological Examination

3.3.1 Postural Examination

Back view:

- Slight flat feet.
- Prominent or thick Achilles tendon of the right foot in comparison with the left foot.
- Calf are symmetrical in contour
- Popliteal of knee in the same line.
- Pronation of the left arm.
- Elevation and protraction of the right scapula.
- Right shoulder higher than left shoulder.
- Head shifted slightly to the right side.
- Gap between thighs

Lateral view in both right/left sides:

- Head protracted
- Kyphosis in thoracic spine
- Flat lumber spine.
- Extension of the both knees
- Arms are slightly flexed in both elbows
- Pronation of the left arm.
- Right fingers are extended, left fingers are slightly flexed.
- Flat both feet.

Front view:

- Right big toes slight valgus (hallux valgus).
- Base of support are in the same line with knees and hips.
- Pronation in the left arm.
- Belly button shifted slightly to the right side.
- Right nipple lower than the left nipple.
- Right Second finger amputated at the distal interphalangeal joint.
- Right shoulder protracted.
- Elevated right shoulder.

3.3.2 Gait Analysis

- Walking was performed with an assistive device (walker with four legs) also with a help of 2 physiotherapists.
- Walking was perfume from the bed to the midway of the corridor distance in total with going back to the bed is 60 metres.
- Patient was hardly stable, looks like he's having a hard time walking especially because of his left foot which was diagnosed with dropped foot (he claimed that he feels strange and exhausted dragging his foot and not being able to dorsal flex the ankle, even though he is trying to encourage himself to dorsal flex the ankle by imagining the motion in his head as we instruct him that it will help to facilitate emphasis the impulses that are been transferred from the muscles to the brain for any kind of motion.
- Walking rhythm was bad in general, slow walking pattern, short length of the steps, walking seems not stable even though he was holding the walker with both hands and 2 therapists were holding his arms all the time and try helping him to move the walker forward to make next step, he wasn’t able to walk in straight line (he couldn't move the walker straight forward, diagonally instead, that pattern confirms that the patient is not stable and not dependent due to the weakness of the ankle flexors and the state of the hand and finger muscles.
- Patient was elevating his right shoulder with slight rotation of the trunk to the right side.
- Patient was using his hand as support to reduce the Wight bearing on the left foot.

- Left hand grip was week and wasn't able to hold the walker firmly by flexing the fingers due to his current situation.
- Foot contacts the floor together in the same time (heel, medial and lateral tarsals)
  The step of the left foot was constantly moving (slight medial diagonally) crossing and intercept the right foot (lack of control of the foot in straight line, not able to move it straight forward.
- Patient slippers was affecting his walking in my opinion, patient had to flex his toes which was in fact severely affected to keep (them on) and prevent them to get loosen.

*In general I can conclude that patient walking pattern was basically not stable due to his current state, there was some errors we have to keep an eye on them and correct them. Moreover in order to achieve the best results we have to find the reasons of his walking pattern in the next followed-up examination and try to address them with the physiotherapeutic methods.

3.3.3. Breathing Examination

While patient was in supine position he was asked to breathe in and out three times, finding: patient was using mostly in the lower abdomen and slightly upper abdomen for breathing.

Breathing rhythm was good, it was properly controlled. Ratio of breath in – breath out was (1:20)

3.3.4 Soft Tissue Examination (According to Lewit 2005)

While patient in prone we started checking the thoracolumbar area and the cervicothoracic area in both side there were no restriction found, in the upper extremity there was a restriction of the left lower arm both medially and literally. In the lower extremity there were a restriction of left lower leg medial direction. Other tissues has no resections.

3.3.5 Palpation of Pelvis

We palpated the pelvis to check if there is any kind of obliquity, we found out that the

- Iliac crests are in the same line
- PSIS: both in the same line (symmetrical)
- ASIS: both in the same line (symmetrical)

3.3.6 Anthropometric Measurement Examination

Length of Lower and Upper Extremities	Left	Right
Functional length ASIS	103 cm	103 cm
Anatomical length	97 cm	97 cm
Thigh	50 cm	50 cm
Leg	46 cm	46 cm
Foot	30 cm	30 cm
Whole arm	75 cm	75 cm
Upper arm	31 cm	31 cm
Forearm	27 cm	27 cm
Hand	17 cm	17 cm

Table 1- Initial Anthropometric measurements for circumference of lower and upper Extremities

Circumferences of Lower and Upper Extremities	Left	Right
Above the knee cap 15 cm (whole quadriceps)	52 cm	53 cm
Above the knee cap 10 cm (vastus medialis)	46 cm	47 cm
Knee	36 cm	36 cm
Calf	33 cm	35 cm
Ankle	31 cm	31 cm
Foot	26 cm	26 cm
Upper Arm	26 cm	28 cm
Forearm	26 cm	27 cm

Table 2- Initial Anthropometric measurements for circumference of lower and upper extremities

3.3.7 Examination of Range of Motion (According to Kendall 2005)

***Note:** During the examination of the Range of Motion we used Two-arm goniometer. The Patient had no contraindication for performing the test. Examination took place in the rehabilitation room of the neurological department in Kladno Oblastní Nemocnice Kladno om 1.2.2017 At 10.30 am. Patient was undressed, position were used are (supine, prone, side-laying), Motions were examined are active range of motion (AROM), passive range of motion (PROM) During the implementation patient had a normal (physiological) end-feel barrier in some joints.

Initial Range of motion of the upper extremities:

Joint	Plane	Right		Left	
Shoulder	Sagittal Frontal Rotation.	Active (20-0-180) (140-0-0) (90-0-70)	Passive (20-0-180) (150-0-0) (90-0-80)	Active (15-0-170) (140-0-0) (85-0-70)	Passive (15-0-180) (150-0-0) (90-0-80)
Elbow	Sagittal	Active (90-0-140)	Passive (0-0-145)	Active (0-0-140)	Passive (0-0-145)
Wrist	Sagittal	Active (70-0-75)	Passive (80-0-85)	Active (40-0-60)	Passive (65-0-75)

Table 3-Initial Range of motion of the upper extremities.

Initial Range of motion of lower extremities:

Joint	Plane	Right		Left	
Hip	Sagittal Frontal Rotation.	Active (10-0-70) 40-0-15 40-0-40	Passive (10-0-80) (45-0-20) (45-0-45)	Active (0-0-70) (25-0-10) (10-0-30)	Passive (90-0-80) (40-90-15) . (30-0-40)
Knee	Sagittal	Active (0-0-120)	Passive (0-0-130)	Active (0-0-100)	Passive (0-0-110)
Ankle	Sagittal	Active (20-0-40)	Passive (25-0-50)	Active (10 -0- 40)	Passive (5 -0- 45)

Table 4-Initial Range of motion of lower extremities

3.3.8 Muscle TonicityExamination (Palpation)

Due to the patient current state, Muscles tonicity which needs to be examined are recorded and listed in the following table:

Muscle	Hypo tone		Hyper tone		physiological tone	
	Right	Left	Right	Left	Right	Left
Soleus				√	√	
gastrocnemius				√	√	
Quadriceps (rectus femoris, vastus medialis, vastus lateralis,				√	√	
Hamstrings					√	√
Adductor magnus		√			√	
Biceps brachi				√	√	
Triceps brachi		√	√			
Supraspinatus		√			√	
Infraspinatus		√			√	
Pronator teres				√	√	
Supinator					√	√
Flexor carpi radilas				√	√	
Flexor carpi ulnaris				√	√	
Flexor digiti muscles				√	√	
Extensor carpi radilas		√			√	
Extendor carpi ulnaris		√			√	
Extensors digiti muscles					√	√

Table 5-Initial Examination of muscle tonicity.

3.3.9 Examination of Superficial Sensation

(√) indicates normal sensation (×) indicate hyposensitivity

Nerve Root	Superficial	
	Right	Left
C5	√	√
C6	√	√
C7	√	√
C8	√	√
T1	√	√
T2	√	√
T3	√	√
L2	√	√
L3	√	√
L4	√	√
L5	√	√
S1	√	×
S2	√	√

Table 6-Initial Examination of superficial sensation

3.3.10 Examination of Deep Sensation

(√) able to identify the direction (×) not able to identify the direction

Fingers and Toes	Deep sensation	
	Right	Left
Big toe	√	√
Small toe	√	√
Other toes	√	√
Thumb	√	√
3rd finger	√	√
5th finger	√	√

Table 7- Initial Examination of deep sensation

Graphesthesia: With my finger i draw random number in his anterior part of the thigh and on his palm, he was able to distinguish the number with closing his eyes.

Stereognosis: I also placed a coin in his palm and he could recognize it with closing his eyes I place a pen in the patients hand while he eyes was closed and asked him to identify what object I gave him. He was able to do it.

Two-Point Discrimination: with closing his eyes, he was able to distinguish if i touched him with one finger or two fingers in his anterior part of the thigh.

3.3.11 Examination of the Reflexes

The results of the Examinations are listed in the following tables:

Primitive Reflex	Response
The Glabellar tap Reflex	Negative
Palmar Grasping Reflex	Negative
Palmomental Reflex	Negative
Snout Reflex	Negative

Table 8- Initial Examination of primitive reflexes.

Examination of Superficial Reflexes

Superficial Reflexes	Response
The corneal and conjunctival reflexes	Negative
The abdominal reflex Ssegmenat of upper abdomin T7-T9, mid abdomin T9-T10, lower abdomin T11-T12	Normal response, the umbicus follow the line been drawn.
Plantar reflex (Babinski)	Positive

Table 9- Initial Examination of superficial reflexes.

Examination of Deep Tendon Reflexes

Deep Tendon Reflexes	Spinal cord Segment	Left Side	Right Side
Biceps	C5-C6	3	2
Triceps	C7	4	2
Flexors	C8	3	2
Patellar	L2-L4	4	3
Achilles	L5-L2	2	2

Table 10- Initial Examination of deep tendon reflexes

3.3.12 Examination of the Pyramidal Tract Sign:

Paretic sign:

Mingazzini test of the upper extremities shows that the patient couldn't hold the arms inform of him, affected arm dropped down after 3 seconds.

Mingazzini test of lower extremities shows that the patient couldn't hold the leg in 90 degrees of both hips and knees. It fall down after 6 seconds

(√) indicates positive sign (×) indicates negative sign

Paretic Sign	Result
Mingazzini (upper)	√
Mingazzini (lower)	√
Dufour	√
Barré	√
Hanzal	√
Rusedskij	√

Table 11- Initial Examination of paretic sign.

3.3.13 Examination for Spastic Sign

(√) indicates positive sign (×) indicates negative sign

Spastic Sign	Right	Left
Juster	×	√
Hoffman	×	√
Babinski´	×	√
Vítek	×	√
Roche	×	√
Oppenheim	×	×
Chaddock	×	√
Rossolimo	×	√

Table 12-Initial Examination for spastic sign.

3.3.14 Cranial Nerves Examination

(√) indicates physiological **(×)** indicates impaired

Cranial nerve	**Result**
I. Olfactory	**(√)**
II. Optic	**(√)**
III. Oculomotor	**(√)**
IV. Trochlear	**(√)**
V. Trigeminal	**(√)**
VI. Abducens	**(√)**
VII. Facialis	**(×)**
VIII. Vestibulocochlear	**(√)**
IX. Glossopharyngeal	**(√)**
X. Vagus	**(√)**
XI. Accessory	**(√)**
XII. Hypoglossal	**(√)**

Table 13-Initial Examination of cranial nerves.

3.3.15 Ashworth Scale Test for Spasticity

Muscles	Result
Biceps brachii	2
Flexor carpi ulnaris	1
Pronator teres	2
Flexor Carpi Radials	2
Flexors Digitorum Profundus	2
Hamstrings	1
Quadriceps	1
Gastrocnemius	2
Soleus	2

Table 14- Initial Examination of spasticity according to Ashworth scale.

3.3.16 Joint Play Examination (According to Lewit 2010)

Upper Extremity		
Joint	**Left**	**Right**
Shoulder joint ventrodorsal-and caudal direction.	Restriction in caudal directions	No Restriction
Acromioclavicular Joint ventrodorsal-craniocaudal direction	No Restriction	No Restriction
Sternoclavicular Joint ventrodorsal-craniocaudal direction	No Restriction	No Restriction
Elbow Joint medial-lateral direction	No Restriction	No Restriction
Radiocarpal Joint	Restriction in dorsal direction	No Restriction
Carpometacarpal Joint	No Restriction	No Restriction
Carpal Bones	No Restriction	No Restriction
Carpometacarpal Joint of the thumb	Restriction in palmar direction	No Restriction
Metacarpophalangeal Joints	Restriction in 3rd and 4th in both dorsal in palmar direction	No Restriction

Table 15-Initial Examination of joint play upper extremities.

Lower Extremity		
Sacroiliac joint	No Restriction	No Restriction
Patella cranial – caudal and medial-lateral direction	No Restriction	No Restriction
Knee joint medial – lateral direction	No Restriction	No Restriction
Tibiofibular joint dorsal - plantar direction	Restriction in ventral directions	No Restriction
Talocrural joint dorsal - plantar direction	Restriction in dorsal direction	No Restriction
Subtalar joint dorsal -plantar direction	No Restriction	No Restriction

Lisfranc's joint dorsal - plantar direction	Restriction in both dorsal and ventral direction	No Restriction
Chopart's joint dorsal - plantar direction	Restriction in dorsal direction	No Restriction
Metatarsophalangeal Joints medial-lateral., dorsal-plantar direction	No Restriction	No Restriction
Interphalangeal Joints medial-lateral., dorsal-plantar direction	Restriction in 2^{nd} and 3^{rd} in lateral and dorsal direction	No Restriction

Table 16- Initial Examination of joint play lower extremities

3.3.17 Examination of ADL

This is the chart of the patient ADL assessment which I observed with a help from the ergotherapist, we recorded these findings and gave the patient a medium degree of dependence level. According to the Barthel Scale test which determines:

0-40 points: Highly dependent

45-60 points: Medium degree of dependence

65-95 points: Light dependence

100 points: Independent

(Total patient's score: 60 points)

Bowels:
0 = dependent
5 = needs some help, but can do something alone
10 = independent
Patient's Score = 5

Bladder:
0 = dependent
5 = needs some help, but can do something alone
10 = independent
Patient's Score = 5

Grooming:
0 = needs help with personal care
5 = independent face/hair/teeth/shaving (implements provided)
Patient's Score = 5

Toilet use:
0 = dependent

5 = needs some help, but can do something alone
10 = independent (on and off, dressing, wiping)
Patient's Score: 5

Feeding:
0 = unable
5 = needs help cutting, spreading butter, etc.
10 = independent (food provided within reach)
Patient's Score: 5

Transfer:
0 = unable – no sitting balance
5 = major help (one or two people, physical)
10 = minor help (verbal or physical)
15= independent
Patient's Score: 10

Mobility:
0 = immobile
5 = wheelchair independent
10 = walks with help of one person (verbal or physical)
Patient's Score: 10

Dressing:
0 = dependent
5 = needs help, but can do about half unaided
10 = independent (including buttons, zips, laces, etc.)
Patient's Score: 5

Stairs:
0 = unable
5 = needs help (verbal, physical, carrying aid)
10= independent up and down
Patient's Score: 5

Bathing:
0 = dependent
5 = independent
Patient's Score: 5

3.3.18 FunctionTests

We gave the patient different types of objects and asked him to grab it from the table:

- **Pen:** He was able to grab it.
- **Coin**: He wasn't able to grab it.

- **Keys**: He was able to grab it.
- **Mobile:** He was able to grab it.
- **Bottle**: He was able to grab it.
- **Paper money**: He wasn't able to grab it.

We also asked him to do some functional activity such as:

- **Opening a wallet:** He was able to open it
- **Reach his back with his affected arm:** he wasn't able to reach his back with his arm
- **Reach the opposite shoulder:** He wasn't able to reach the opposite shoulder
- **Reach over his head and touch his ear:** He wasn't able to touch his ear

3.3.19 Cerebellum Examination

- **Rapidly Alternating Movement:** He was able to perform it
- **Rebound test:** while flexed his arm i hold his arm above the wrist and tried to extend his arm and leave it suddenly, the patient antagonist (triceps) muscles worked to let the arm stays on the same place and arm didn't bound.
- **Finger to nose test:** poor performance, he was pointing his upper lip instead
- **Heel to shin coordination test:** not able, heel fall over the shin before reaching the distal part

3.3.20 Romberg Test

Patient could perform the test without an assistive aid.

- **Romberg I:** He was able to perform the test with open eyes and legs a part, we noticed that his weight bearing was mostly on the healthy limb.
- **Romberg II:** with eyes open and legs together. lost the balance after 5s.
- **Romberg III:** with eyes closed and legs together. lost the balance after 2s

3.3.21 Initial Examination's Conclusion

In summary of all the examinations which were implanted to the patient, we can conclude some of the findings of his examination. Patients is after Ischemic Cerebrovascular Accident CMV (stroke) His left side is affected, Strong hemi paresis and weakness especially on his flexors of the fingers and ankle dorsal flexion. In my point of view, his lack of dependent is clear during the aspection. During initial examination we noticed that the postural faulty is presented in the all views (frontal, dorsal, lateral) our aim is to correct the faulty postural as possible.

In the gait pattern analysis as we explain in detail above, we can conclude that the subject gait is also affected due to his current state which disturbs his walking pattern and implies 2 assistance holding him with the walker, his main problem during walking is the left (drooped foot) which he couldn't control and make it impossible to make a proper stride, instead he was dragging his left leg to accomplish the stride. In the other hand the breathing pattern as we mentioned above was performed mainly on the lower abdomen, without any kind of restriction, he could control his breathing properly. After the assessment of Soft tissue we found out a slight restriction on the left lower arm in both direction medially and laterally, also a restriction on the left lower leg in medial direction.

After the Anthropometric examination we recorded some decrease in the range of motion on the affected side, precisely on the ankle and wrist. Fingers were assessed during the functional movement of the fingers. We found out that the subject's ability of opposition is only to the 2nd Phalangeal. Muscle tonicity as recorded above are showing a significant muscles hypertonicity with some hypotonicity also in the affected left limb such as (hyper) soleus and gastrocnemius, and (hypo) tibilas ant., also hyper tonicity in the finger flexors due to the position of the fingers. Joint play examination was also restricted in various joints especially in the affected limb which are shown above in the table of the Joint play.

After assessing the deep tendon reflexes we noticed a hyper reflexology of the segment of biceps (C5-C6.), triceps (C7), and patella (L2-L4). In Sensation assessment we found out that the superficial sensation was physiological except the nerve root (S1) which shows a hyposensitivity. On the other hand the deep sensation examinations: Two-Point Discrimination, Stereognosis, Graphesthesia and Kinesthesia: Shows that the patient has a physiological results.

In the Reflexes examination we found out that the primitive reflexes was negatives in all 4 tests. The superficial reflex outcomes was a positive sign of the planter reflex (Babinski) The cranial nerve examination shows that the 7th facial nerve was slightly affected.

Moreover the spasticity Ashowrth test shows a marked increase in muscle tone on biceps brachi and pronator teres. During the examination of the pyramidal tract we noticed a significant positivity paretic sign of the upper and the lower extremities. In the other hand spastic sign also shows a positive sign of affected lower and upper extremities. The cerebellar examination show a lack of coordination and precision with performing the tests. ADL are clearly poor in each aspects, lack of self-dependency are clear, In my personal point of view and according to the outcomes of the subject's current state we have to address the problems and regain the lost functions by making a plan which he will follow during his staying at the hospital and even after discharging him.

3.4 The Goal of Short and Long – Term Rehabilitation Plan

3.4.1 The Goal of Short - Term Rehabilitation Plan

- Increase range of motion in the ankle to dorsal flexion and in the wrist into both palmer, planter flexion
- Improve the stability in standing positon.
- Reduce the spasticity in the biceps, pronator teres, and gastrocnemius.
- Correct the walking pattern.
- Improve the verticalization.
- Regain fine motor function.
- Improve ADL.
- Mobilize the restricted joint play.
- Release the restriction in the soft tissue of the affected lower leg and arm.

3.4.2 The Goal of Long – Term Rehabilitation Plan:

- We should continue achieving the goals of the short term plan.
- Prepare the patient to integrate with the social life.
- Continue improving his self-dependency.
- Improve his basic ADL.
- Improve endurance
- Prepare the subject to deal and face any obstacles he might face in the in the external environment such as using public transportation and shopping.

3.5 Day to Day Therapy Sessions

Date: 2/2/2017 Session no.1

Objective: is the first focused therapy procedure after taking the initial examination yesterday which lasted for 2 hours divided by 1 hour in the morning and 1 hour in the afternoon, and due to the effort of the patient who was nicely cooperating with me during the examination but he seemed exhausted and claimed that he felt fatigue yesterday night because of the long examinations so I suggested to not implement much exercises in the morning, and postponed it to the afternoon session. I just stretched and relaxed his muscles and mobilized the joint play restrictions with releasing the facia restriction.

Subjective: no pain presented, patient seems depressed due to his disability.

Plan and goal of the today's session:

Morning session:

- Stretching and reduce spasticity.
- Mobilization of the joint play restrictions
- Soft tissue technique to release facia restriction.

Afternoon session:

- Repeat the same procedures in the morning.
- DVT prevention.
- Passive and active movement exercise to increase the ROM and facilitate the affected muscles.
- Verticalization instruction and exercising.
- PNF short diagonal as instructed by the supervisor due to the patient's current state.

- Function exercising to improve his self-dependency
- Sensomotoric exercises to improve his stabilization.
- Facilitation for the drooped foot by applying the electro-stimulation.
- Walking exercise and correcting his faulty walking pattern as possible.
- Moto-med for the lower extremity for 20 min. devise brought to the patent's bed.

Discerption of the therapy procedure:

- We started doing passive movement of the upper and lower extremities, first hip joint into flexion, abduction, adduction, extension, external rotation and internal rotation, then we continue caudally to the knee into flexion and extension, after that we continue caudally to the ankle into dorsal flexion, planter flexion, inversion and eversion and circumduction.; all of these exercises where performed while patient was in supine position. For 8 times 2 repetition.
- Then for exercising the deep vein thrombosis prevention (DVT), we asked him to do actively ankle dorsal flexion, planter flexion, and circumduction. For 8 times 2 repetition.
- Isometric contraction of quadriceps, hamstrings, gluteal muscles. In supine position, 8 times 3 repetition.
- Bridging exercise to strength the core muscles and the gluteal muscles. In supine position patient flex his knees and inflated ball inserted between his knees, then rise his pelvis up to the celling while contracting the gluteal muscles and abdomen then go back to the starting position. For 10 times 2 repetition.
- Inflated ball placed under his heel of the affected side; he tries to drag the ball cranially while flexing both hip and knee. We had to fix the patient's knee to be straight and to not go outward due to his lack of control. Meanwhile we are asking him to keep this proper position while doing the exercise.
- Also the same exercises were performed on the upper extremity. While patient was in supine position we gave him an inflated ball between his hands and asked him to drag it cranially up to his chin by his fingers and wrist, while flexing his elbows and try to focus on the affected arm especially the fingers and wrist motion; this exercise aimed to facilitate the paretic muscles. Patient claimed that it was hard for him, and reaction of his face confirmed that.
- Prolonged stretching in supine position for gastrocnemius, soleus and hand flexors for 20s 2 times.
- Also we released the restriction of the facia of the lower arm and leg of the left extremities. We started in laying position while the patient was flexing his left knee, we took up the

slack to the restricted side, and waited for release. Same technique applied on the lower left arm.

- Also we did some function strengthening exercises for the lower extremity. In supine position he flexed both hips and knees; we inserted inflated ball between his knees and both of my hands were placed in the lateral side of his knees. Now he presses inward the ball for 3s then pushes outward against my hands for 3s. 8 times 2 repetition.
- PNF only the short diagonals: 1st diagonal flexion and extension. 2nd diagonal flexion and extension. Due to the patient current state and the instruction of the supervisor.
- Joint mobilization for the restricted joint. In sitting position we started mobilizing the 3rd and 4th Interphalangeal Joints and Metacarpophalangeal Joint in both dorsal and palmar direction 20 repeated springing in each joint
- We continued mobilizing the radiocarpal joint of the left arm into dorsal direction; 15 repeated springing
- Then we continued proximally mobilizing the shoulder joint into ventral-dorsal and caudal direction while the patient abducted his arm 90 degree; 20 repeated springing in each direction.
- We switched to the lower extremity, starting to mobilize the left 2nd and 3ed Interphalangeal Joint into dorsal and lateral direction; 20 repeated springing in each direction.
- Then we distally continued mobilizing the Lisfrance (dorsal and ventral direction); Chopart's (dorsal direction); 20 repeated springing in each direction.
- In supine position while the patient slightly flexed his knee, we mobilized the left Talucural Joint distally; 20 repeated rhythmic springing; also we did a traction technique HVLA thrust.
- We continued cranially mobilizing the Tibiofibular Joint of the left leg dorsally; 20 repeated springing.
- Gait exercising with using the "WalkAid" Device. patient is using two crutches, and assisted by me for safety, we asked him to try actively dorsal flex his foot during the swing phase as the device send the stimuli, distance achieved is 30m,
- (Electro-stimulation) Done in the rehabilitation room for 10 min. Electrodes placed on the peroneal nerve to trigger the tibialis anterior muscle to dorsal flex the ankle. (Intensity: 26mA, Frequency: 50Hz, Impulse: 300ms, Stimulation time5s, Pause time: 25s.)
- Moto-med lower extremity 10 min, speed is 24 rpm. Brought to the patient's bed, at the end of the session we monitor shows that the patient the symmetry of work done is (left: 18) (right: 82).

- Ergo therapy exercising with different types of games that has the effect to improve his fine motor skills such as thera-putty (Clay) which has different kind of colours. Each colour offers a different kind of firmness level and resistance, giving the patient the ability to strengthen his fingers by performing many kind of exercises supervised by the ergo therapist. We also used (Nine Holes) peg board to improve the fine motor hand and eye coordination. We did this (Nine Holes) peg board test in the ergotherapy room. He completed the set in 4m, 34s of his affected hand, and 31s on the healthy hand. During the test patient found it hard to grasp the object due to inability to oppose his thumb and finger properly. He was grasping the object with a minimal control. The object was falling from his grasp repeatedly.
- Also he provided plenty type of exercises with the thera-putty (clay) to improve his fine motor skills and strength such as finger hook: trying to make a hook with the fingers and pressing the thera-putty, full grip: by squeezing the fingers to the thera-putty and imaging making a fist, finger extension: put the thera-putty on the table and trying to role it with the fingers into extension., finger scissor: putting the thera-putty between each fingers and trying to cut it like a scissors., finger spread: by placing the thera-putty around 2 fingers and trying to abduct the fingers., thumb press: placing the thera-putty in the palm and pressing it with the thumb, three jaw chuck pinch: holding the thera-putty with the healthy hand and pulling the thera-putty by the affected hand. (Figure13)

Figure13: an example of the patient's exercises in the ergo therapy room.

These exercises had a significant improvement on my patient. I asked the ergo therapist if it was possible to borrow some games to the room so that my patient could exercise whenever he wanted. She agreed and borrowed us a peg bored with spiky -ball.

During the day to day therapy I noticed an increase in the strength and range of motion.

Objective: patient performed the exercises very well, he was active in the afternoon session. His gait is in general is better than yesterday, it was more stable. Patient's handshake is stronger than yesterday, he can grasp smaller objects.

Subjective: Patients has no pain as he claimed, only fatigue form the exercises. His psychological situation is better than yesterday, he is less depressed today.

Date: 3/2/2017 Session no.2

Objective: At 8.55am session started, patient just finished the breakfast, and ready for the session. He was in the sitting position in the bed, nurse came to give him his medication and unplug the intervenors catheter (tube), so we can exercise. Patient said that he feel some improvement of his hand function and kept showing me his grip strength, I confirmed to him that I feel the hand grip better than yesterday, he also said that he was exercising with spiky ball as I instructed him to squeeze the ball 20 times 3 repetitions.

Subjective: patient didn't claimed of any pain, only complaining about the disability again, his psychological state is clearly seen in his face, so I tried to motivate him that the progress as he saw today in his hands, going to improve more in the next days, I also told him that he needs to motivate himself to achieve his goals.

Plan and goals for today's session:

- Stretching and reduce spasticity.
- Mobilization of the joints restrictions
- Soft tissue technique to release facia restriction.
- DVT prevention.
- Passive and active movement exercise to increase the ROM and facilitate the affected muscles.
- Verticalization instruction and exercising.
- PNF.
- Function exercising to improve his self-dependency

- Sensomotoric exercises to improve his stabilization.
- Electro-stimulation for the dropped foot
- Walking exercise and correcting his faulty walking pattern as possible.
- Moto-med for the lower extremity for 20 min. devise brought to the patent's bed.

Discerption of the therapy procedure:

- We started doing passive movement of the upper and lower extremities, first hip joint into flexion, abduction, adduction, extension, external rotation and internal rotation., then we continue caudally to the knee into flexion and extension., after that we continue caudally to the ankle into dorsal flexion, planter flexion, inversion and eversion and circumduction., all of these exercises where performed while patient was in supine position., for 8 times 2 repetitions.
- Then exercising for the deep vein thrombosis prevention (DVT) in supine position, we asked him to do actively ankle dorsal flexion, planter flexion, and circumduction. For 8 times 2 repetitions.
- Isometric contraction of quadriceps, hamstrings, gluteal muscles. In supine position, 8 times 3 repetition.
- Bridging exercise to strength the core muscles and the gluteal muscles while in supine position patient flex both hips and knees, inflated ball inserted between his knees, rising his pelvis up to the celling while contracting the gluteal muscles and abdomen then go to the starting position. For 10 times 2 repetitions.
- In supine, inflated ball placed under his heel of the affected side, he tries to drag the ball cranially while flexing both hip and knee we had to fix the patient's knee to be in an alignment and does not go outward due to his lack of control, while asking him to keep this proper position while doing the exercise. 8 times 2 repetitions.
- Also the same exercise were performed on the upper extremity while patient in supine position we gave him an inflated ball between his hands and asked him to drag it cranially up to his chin by his fingers while flexing his elbows and try to focus on the affected arm especially the fingers and wrist motion, 8 times 2 repetitions. This exercise aimed to facilitate the paretic muscles, patient claimed that it was hard for him, and the reaction of his face confirms that.
- Prolonged stretching in supine position for gastrocnemius, soleus and hand flexors of the affected side. For 20s 2 times. As Instructed by the supervisor.

- Sensomotoric exercises to improve his stabilization, while seated in feet on the on the ground, we ask him to make an arch of his foot, by bringing the toes back to the heel without flexing the toes.
- Also we released the restriction of the facia of the lower arm and leg of the left extremities side, we started in laying position while the patient's flexes his left knee, and we took up the slack to the restricted side, and waited for release. Same technique applied on the lower left arm
- Also we did some function exercises for the lower extremity. In supine position he flexes both hips and knees, we inserted inflated ball between his knees and both of my hands placed in the outer lateral side of his knees, now he presses inward the ball for 3s then pushes outward against my hands for 3s. 8 times 2 repetition.
- PNF Facilitation Exercises (1st diagonal flexion and extension. 2nd diagonal flexion and extension) without techniques only following the diagonal active as possible for the upper and lower left extremity, due to the patient's current state and the instruction of the supervisor. Until he regains some strength
- Joint mobilization for the restricted joint, in sitting position we started mobilizing the 3rd and 4th Interphalangeal Joints and metacarpophalangeal joint in both dorsal and palmar direction 20 repeated springing in each joint
- We continue mobilizing the radiocarpal joint of the left arm into dorsal direction 15 repeated springing
- Then we continue proximally mobilizing the shoulder joint into ventro-dorsal and caudal direction while the patient abduct his arm 90 degree, 20 repeated springing in each direction.
- We switched to the lower extremity, starting mobilize the left 2nd and 3rd interphalangeal joint into dorsal and lateral direction.20 repeated springing in each direction.
- Then we distally continued mobilizing the Lisfrance (dorsal and ventral direction), Chopart's (dorsal direction), 20 repeated springing in each direction.
- In supine position while the patient slightly flex his knee, we mobilize the left talucural joint distally 20 repeated rhythmic springing, also we did a traction technique HVLA thrust.
- We continued cranially mobilizing the tibiofibular joint of the left leg dorsally, 20 repeated springing.
- Gait exercising with using the "WalkAid" device. Patient is using two crutches, and assisted by me for safety, we asked him to try actively dorsal flex his foot during the swing phase as the device send the stimuli, distance achieved is 40m,

  Objective: Patient was cooperating well with the exercises, walking pattern still poor, but better than before, patient's grip is stronger than yesterday, he can grasp smaller objects.

Subjective: He feels more confident as he said, but still needs more effort to reach his goal, he's looking forward to move to the rehabilitation department on Saturday. Because I won't see him during the weekend, I instructed him to make the same exercises which we did with the inflated-ball and spiky ball, also I gave him his (rube-rubber) to use it for stretching his calf muscles exactly the same principle what I did during the stretching. 20s 3 repetition. I also asked him to try use more the affected limb and not be dependent only on the health limb to avoid the (neglect syndrome). Next session will be on Monday

Date: 6/2/2017 Session no.3

Objective: On Monday at 9;15 session started in the rehabilitation department after being transferred from the neurological department on Saturday, patient was laying on the bed,2 crutches fixed on his bed, patient can sit independently, I asked him how did he feel and how did the exercises go. He replied that he did exactly what I instructed him to do and finally he could see benefits and progression, he showed me his new shows which his girlfriend brought during the weekend and he claimed that he walked more comfortably comparing with his last (sandals) which were loose while he walk due to his dropped foot.

Subjective: he feels happy being in the rehabilitation department, his psychological state seems better due to the in-patients friends in his room

Plan and goals for today's session:

- Stretching and reduce spasticity.
- Mobilization of the joints restrictions
- Soft tissue technique to release facia restriction.
- DVT prevention.
- Passive and active movement exercise to increase the ROM and facilitate the affected muscles.
- Verticalization instruction and exercising.
- PNF (Facilitation and Relaxation Techniques)
- Function exercising to improve his self-dependency
- Sensomotoric exercises to improve his stabilization.
- Electro-stimulation for the dropped foot
- Walking exercise and correcting his faulty walking pattern as possible.
- Moto-med for the upper and lower extremity in the rehabilitation room.

Discerption of the therapy procedure:

- We started doing passive movement of the upper and lower extremities, first hip joint into flexion, abduction, adduction, extension, external rotation and internal rotation., then we continue caudally to the knee into flexion and extension., then we continue caudally to the ankle into dorsal flexion, planter flexion, inversion and eversion and circumduction., all of these exercises where performed while patient was in supine position., for 8 times 2 repetitions.
- Then exercising for the deep vein thrombosis prevention (DVT) in supine position, we asked him to do actively ankle dorsal flexion, planter flexion, and circumduction. For 8 times 2 repetitions.
- Isometric contraction of quadriceps, hamstrings, gluteal muscles. In supine position, 8 times 3 repetition.
- Bridging exercise to strength the core muscles and the gluteal muscles while in supine position patient flex both hips and knees, rising his pelvis up to the celling while contracting the gluteal muscles and abdomen then go to the starting position. For 10 times 2 repetitions.
- In supine inflated ball placed under his heel of the affected side, he tries to drag the ball cranially while flexing both hip and knee, while asking him to keep this proper position while doing the exercise. 8 times 2 repetitions. (he can control the movement better than before)
- Also the same exercise were performed on the upper extremity while patient in supine position we gave him an inflated ball between his hands and asked him to drag it cranially up to his chin by his fingers while flexing his elbows and try to focus on the affected arm especially the fingers and wrist motion, 8 times 2 repetitions, patient using the affected hand more than before, which means that there is improvement.
- Prolonged stretching in supine position for gastrocnemius, soleus and hand flexors of the affected side. For 20s 2 times. As Instructed by the supervisor.
- Also we released the restriction of the facia of the lower arm and leg of the left extremities side, we started in laying position while the patient's flexes his left knee, and we took up the slack to the restricted side, and waited for release. Same technique applied on the lower left arm
- Sensomotoric exercises to improve his stabilization, while seated in feet on the on the ground, we ask him to make an arch of his foot, by bringing the toes back to the heel without flexing the toes.
- Also we did some function exercises for the lower extremity. In supine position he flexes both hips and knees, we inserted inflated ball between his knees and both of my hands placed

in the outer lateral side of his knees, now he presses inward the ball for 3s then pushes outward against my hands for 3s. 8 times 2 repetition.

- PNF facilitation Exercises (Repeated Contraction technique: 1st diagonal flexion and extension. 2nd diagonal flexion and extension for the upper and lower left extremity. 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: 1st diagonal flexion and extension. 2nd diagonal flexion and extension for the upper and lower left extremity. 8 repetitions.
- PNF facilitation Exercises (Repeated Contraction technique: Scapula in anterior – posterior elevation, anterior-posterior depression) bilateral, 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: Scapula in anterior – posterior elevation, anterior-posterior depression) bilateral, 8 repetitions.
- PNF facilitation Exercises (Repeated Contraction technique: pelvis in anterior – posterior elevation, anterior-posterior depression) bilateral 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: pelvis in anterior – posterior elevation, anterior-posterior depression) bilateral 8 repetitions.
- Joint mobilization for the restricted joint, in sitting position we started mobilizing the 3rd and 4th Interphalangeal Joints and metacarpophalangeal joint in both dorsal and palmar direction 20 repeated springing in each joint
- We continue mobilizing the radiocarpal joint of the left arm into dorsal direction 15 repeated springing
- Then we continue proximally mobilizing the shoulder joint into ventro-dorsal and caudal direction while the patient abduct his arm 90 degree, 20 repeated springing in each direction.
- We switched to the lower extremity, starting mobilize the left 2nd and 3rd interphalangeal joint into dorsal and lateral direction.20 repeated springing in each direction.
- Then we distally continued mobilizing the Lisfrance (dorsal and ventral direction), Chopart's (dorsal direction), 20 repeated springing in each direction.
- In supine position while the patient slightly flex his knee, we mobilize the left talucural joint distally 20 repeated rhythmic springing, also we did a traction technique HVLA thrust.
- We continued cranially mobilizing the tibiofibular joint of the left leg dorsally, 20 repeated springing.
- Walking with the (WalkAid), patient is using one crutch on the healthy side, and assisted by me on his affected side for safety, we asked him to try actively dorsal flex his foot during the swing phase as the device send the stimuli, distance achieved is 50m,

Objective: Patient did a great job in today's session. He was active, the improvement can be seen in all the aspects, but still needs more to bring him back to the normal life.

Subjective: He felt exhausted by happy that he could do the exercises, for self-therapy: he should make the same exercises and remember my instructions, also improve his fine motor function with the (peg board game).

Date: 7/2/2017 Session no.4

Objective: On Tuesday patient went for (Transoesophageal echocardiography test) for the heart to investigate and check why the patient had ischemic stroke, they had a suspicion of a clots in the chambers of the heart. Patient had to fasting from food, so we will have only one session today in the afternoon.

Subjective: patient is nervous about the (Transoesophageal echocardiography test),

Plan and goals for today's session:

Today plan will be only:

- Mobilization of the joints restrictions
- Passive and active movement exercise to increase the ROM and facilitate the affected muscles.
- PNF (Facilitation and Relaxation Techniques)
- Function exercising to improve his self-dependency
- Walking exercise and correcting his faulty walking pattern as possible.

Discerption of the therapy procedure:

- Sensomotoric exercises to improve his stabilization, while seated in feet on the on the ground, we ask him to make an arch of his foot, by bringing the toes back to the heel without flexing the toes, we also tied Bobath technique, while the patient is standing next to the bed, he hold the bed with one hand and make a swing phase with the affected leg 8 times 3 repetition, also he can stand in front of the wall and try rise his body with both toes, if he loses a balance the wall will fic him, the same technique applied but this time he rise his body with his heals while the wall is behind him, patient found it hard to make this exercise.
- We started doing passive movement of the upper and lower extremities, first hip joint into flexion, abduction, adduction, extension, external rotation and internal rotation., then we continue caudally to the knee into flexion and extension., then we continue caudally to the ankle into dorsal flexion, planter flexion, inversion and eversion and circumduction., all of

these exercises where performed while patient was in supine position., for 8 times 2 repetitions.

- Prolonged stretching in supine position for gastrocnemius, soleus and hand flexors of the affected side. For 20s 2 times. As Instructed by the supervisor.
- PNF facilitation Exercises (Repeated Contraction technique: 1st diagonal flexion and extension. 2nd diagonal flexion and extension for the upper and lower left extremity. 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: 1st diagonal flexion and extension 2nd diagonal flexion and extension for the upper and lower left extremity. 8 repetitions.
- PNF facilitation Exercises (Repeated Contraction technique: Scapula in anterior – posterior elevation, anterior-posterior depression) bilateral, 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: Scapula in anterior – posterior elevation, anterior-posterior depression) bilateral, 8 repetitions.
- PNF facilitation Exercises (Repeated Contraction technique: pelvis in anterior – posterior elevation, anterior-posterior depression) bilateral 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: pelvis in anterior – posterior elevation, anterior-posterior depression) bilateral 8 repetitions.
- Joint mobilization for the restricted joint, in sitting position we started mobilizing the 3rd and 4th Interphalangeal Joints and metacarpophalangeal joint in both dorsal and palmar direction 20 repeated springing in each joint
- We continue mobilizing the radiocarpal joint of the left arm into dorsal direction 15 repeated springing
- Then we continue proximally mobilizing the shoulder joint into ventro-dorsal and caudal direction while the patient abduct his arm 90 degree, 20 repeated springing in each direction.
- We switched to the lower extremity, starting mobilize the left 2nd and 3rd interphalangeal joint into dorsal and lateral direction.20 repeated springing in each direction.
- Then we distally continued mobilizing the Lisfrance (dorsal and ventral direction), Chopart's (dorsal direction), 20 repeated springing in each direction.
- In supine position while the patient slightly flex his knee, we mobilize the left talucural joint distally 20 repeated rhythmic springing, also we did a traction technique HVLA thrust.
- We continued cranially mobilizing the tibiofibular joint of the left leg dorsally, 20 repeated springing.
- Walking with the (WalkAid), patient is using one crutch on the healthy side, and assisted by me on his affected side for safety, we asked him to try actively dorsal flex his foot during the swing phase as the device send the stimuli, distance achieved is 60m,

Objective: Patient still managed to make some exercises even though he was exhausted and week after the (Transoesophageal echocardiography test),

Subjective: No pain reported, but still feels exhausted after the (Transoesophageal echocardiography test)

Date: 8/2/2017 Session no.5

Objective: On Wednesday at 9.00am session started, patient said that he can alone with one crutch, also, he is using his affected hand to drink the water. He looks better today when seeing him verticalizing more stable.

Subjective: H feels exited and active. He is willing to walk alone with one crutch.

Plan and goals for today's session:

Today with under the control of my supervisor we will try DNS method. According (to Kolar)

- Stretching and reduce spasticity.
- Mobilization of the joints restrictions
- Soft tissue technique to release facia restriction.
- Passive and active movement exercise to increase the ROM and facilitate the affected muscles.
- PNF (Facilitation and Relaxation Techniques)
- Function exercising to improve his self-dependency
- Sensomotoric exercises to improve his stabilization.
- Electro-stimulation for the dropped foot
- Walking exercise and correcting his faulty walking pattern as possible.
- Moto-med for the upper and lower extremity in the rehabilitation room.

Discerption of the therapy procedure:

- DNS exercises: In the rehabilitation room we put the patient to the 7 month quadruped position, he couldn't hold the position due to his left arm weaknesses we modified the position and asked him support his forearms on the table instead of his palms, we asked him to move forward and backward, he did 6 forward and backwards then asked us to stop.
- We started doing passive movement of the upper and lower extremities, first hip joint into flexion, abduction, adduction, extension, external rotation and internal rotation., then we continue caudally to the knee into flexion and extension., then we continue caudally to the ankle into dorsal flexion, planter flexion, inversion and eversion and circumduction., all of

these exercises where performed while patient was in supine position., for 8 times 2 repetitions.

- Prolonged stretching in supine position for gastrocnemius, soleus and hand flexors of the affected side. For 20s 2 times. As Instructed by the supervisor.
- PNF facilitation Exercises (Repeated Contraction technique: 1st diagonal flexion and extension. 2nd diagonal flexion and extension for the upper and lower left extremity. 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: 1st diagonal flexion and extension. 2nd flexion and extension for the upper and lower left extremity. 8 repetitions.
- PNF facilitation Exercises (Repeated Contraction technique: Scapula in anterior – posterior elevation, anterior-posterior depression) bilateral, 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: Scapula in anterior – posterior elevation, anterior-posterior depression) bilateral, 8 repetitions.
- PNF facilitation Exercises (Repeated Contraction technique: pelvis in anterior – posterior elevation, anterior-posterior depression) bilateral 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: pelvis in anterior – posterior elevation, anterior-posterior depression) bilateral 8 repetitions.
- mobilizing the radiocarpal joint of the left arm into dorsal direction 15 repeated springing
- Then we continue proximally mobilizing the shoulder joint into ventro-dorsal and caudal direction while the patient abduct his arm 90 degree, 20 repeated springing in each direction.
- We switched to the lower extremity, starting mobilize the left 2nd and 3rd interphalangeal joint into dorsal and lateral direction.20 repeated springing in each direction.
- Then we distally continued mobilizing the Lisfrance (dorsal and ventral direction), Chopart's (dorsal direction), 20 repeated springing in each direction.
- We continued cranially mobilizing the tibiofibular joint of the left leg dorsally, 20 repeated springing.
- Walking with the (WalkAid), patient is using one crutch on the healthy side, patient insisted that he can walk alone, and he did. I was walking beside him in case of fall. distance achieved is 70m,
- We also tried walking on the stairs, I was under him while going down stairs, and behind him while going up stairs, patient had to hold the handrail and with the other hand holding the crutch, and he needs more time to adapt walking on stairs.

Objective: In general patient was progressing fast, especially his walking and fine motor function, he needs to focus on stability exercises to achieve more progression.

Subjective: In the afternoon his girlfriend came to visit him, while he is exercising with the ergotherapist, suddenly he cried when he saw her, we tried to calm him down but he kept saying that he is not functioning like before, we ensured him that he will regain his ability since he's practicing with the physiotherapist and ergotherapist.

Date: 9/2/2017 Session no.6

Objective: On Thursday at 10: patient seems in a good mood today, nothing important to mention, the same as yesterday he is looking forward more improvement

Subjective: He was asking when he will be able to not use the crutches, I replied it depends on you and how active you will be in the exercises.

Plan and goals for today's session:

- DNS method. According (to Kolar)
- Stretching and reduce spasticity.
- Mobilization of the joints restrictions
- Soft tissue technique to release facia restriction.
- Passive and active movement exercise to increase the ROM and facilitate the affected muscles.
- PNF (Facilitation and Relaxation Techniques)
- Function exercising to improve his self-dependency
- Sensomotoric exercises to improve his stabilization.
- Electro-stimulation for the dropped foot
- Walking exercise and correcting his faulty walking pattern as possible.
- Moto-med for the upper and lower extremity in the rehabilitation room.

Discerption of the therapy procedure:

- DNS exercises: the same like yesterday, we straight put the patient to the 7 month quadruped position supported by his forearms on the table instead of his palms, we asked him to move forward and backward, he did 8 forward and backwards then stopped.
- We did passive movement of the upper and lower extremities, first hip joint into flexion, abduction, adduction, extension, external rotation and internal rotation., then we continue

caudally to the knee into flexion and extension., then we continue caudally to the ankle into dorsal flexion, planter flexion, inversion and eversion and circumduction., all of these exercises where performed while patient was in supine position., for 8 times 2 repetitions.

- Prolonged stretching in supine position for gastrocnemius, soleus and hand flexors of the affected side for 20s 2 times as Instructed by the supervisor.
- PNF facilitation Exercises (Repeated Contraction technique: 1st diagonal flexion and extension. 2nd diagonal flexion and extension for the upper and lower left extremity. 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: 1st diagonal flexion and extension. 2nd diagonal flexion and extension for the upper and lower left extremity. 8 repetitions.
- PNF facilitation Exercises (Repeated Contraction technique: Scapula in anterior – posterior elevation, anterior-posterior depression) bilateral, 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: Scapula in anterior – posterior elevation, anterior-posterior depression) bilateral, 8 repetitions.
- PNF facilitation Exercises (Repeated Contraction technique: pelvis in anterior – posterior elevation, anterior-posterior depression) bilateral 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: pelvis in anterior – posterior elevation, anterior-posterior depression) bilateral 8 repetitions.
- mobilizing the radiocarpal joint of the left arm into dorsal direction 15 repeated springing
- Then we continue proximally mobilizing the shoulder joint into ventro-dorsal and caudal direction while the patient abduct his arm 90 degree, 20 repeated springing in each direction.
- We switched to the lower extremity, starting mobilize the left 2nd and 3rd interphalangeal joint into dorsal and lateral direction.20 repeated springing in each direction.
- Then we distally continued mobilizing the Lisfrance (dorsal and ventral direction), Chopart's (dorsal direction), 20 repeated springing in each direction.
- We continued cranially mobilizing the tibiofibular joint of the left leg dorsally, 20 repeated springing.
- Sensomotoric exercises to improve his stabilization, while seated in feet on the on the ground, we ask him to make an arch of his foot, by bringing the toes back to the heel without flexing the toes, we also tied Bobath technique, while the patient is standing next to the bed, he hold the bed with one hand and make a swing phase with the affected leg 8 times 3 repetition, also he can stand in front of the wall and try rise his body with both toes, if he loses a balance the wall will fic him, the same technique applied but this time he rise his body with his heals while the wall is behind him, he was better this time and he did it 8 times.

- Walking with the (WalkAid), patient is using one crutch on the healthy side, distance achieved is 70m, he walked alone, and I was just walking beside him for safety.
- We also tried walking on the stairs, I was under him while going down stairs, and behind him while going up stairs, patient had to hold the handrail and with the other hand holding the crutch, and he needs more time to adapt walking on stairs.

  Objective: he seems more confident, more stabilized, more endurance.

  Subjective: he is satisfied with today's session.

Date: 10/2/2017 Session no.7

Objective: On Friday, the last treatment session with the patient, in general he's current state is much better than the first day.

Subjective: patient looks ready for the therapy session.

Plan and goals for today's session:

- DNS method. According (to Kolar)
- Stretching and reduce spasticity.
- Mobilization of the joints restrictions
- Passive and active movement exercise to increase the ROM and facilitate the affected muscles.
- PNF (Facilitation and Relaxation Techniques)
- Function exercising to improve his self-dependency
- Sensomotoric exercises to improve his stabilization.
- Walking exercise and correcting his faulty walking pattern as possible.

Discerption of the therapy procedure:

- DNS exercises: We tried a position of 5 months child in side-laying, patient wasn't able to keep the movement, it was hard for him as he said.
- We did passive movement of the upper and lower extremities, first hip joint into flexion, abduction, adduction, extension, external rotation and internal rotation., then we continue caudally to the knee into flexion and extension., then we continue caudally to the ankle into dorsal flexion, planter flexion, inversion and eversion and circumduction., all of these exercises where performed while patient was in supine position., for 8 times 2 repetitions.

- Prolonged stretching in supine position for gastrocnemius, soleus and hand flexors of the affected side. For 20s 2 times. As Instructed by the supervisor.
- PNF facilitation Exercises (Repeated Contraction technique: 1st diagonal flexion and extension. 2nd diagonal flexion and extension for the upper and lower left extremity. 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: 1st diagonal flexion and extension. 2nd diagonal flexion and extension for the upper and lower left extremity. 8 repetitions.
- PNF facilitation Exercises (Repeated Contraction technique: Scapula in anterior – posterior elevation, anterior-posterior depression) bilateral, 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: Scapula in anterior – posterior elevation, anterior-posterior depression) bilateral, 8 repetitions.
- PNF facilitation Exercises (Repeated Contraction technique: pelvis in anterior – posterior elevation, anterior-posterior depression) bilateral 8 repetitions.
- PNF Relaxation Exercises (Hold-Relaxation technique: pelvis in anterior – posterior elevation, anterior-posterior depression) bilateral 8 repetitions.
- mobilizing the radiocarpal joint of the left arm into dorsal direction 15 repeated springing
- Then we continue proximally mobilizing the shoulder joint into ventro-dorsal and caudal direction while the patient abduct his arm 90 degree, 20 repeated springing in each direction.
- We switched to the lower extremity, starting mobilize the left 2nd and 3rd interphalangeal joint into dorsal and lateral direction.20 repeated springing in each direction.
- Then we distally continued mobilizing the Lisfrance (dorsal and ventral direction), Chopart's (dorsal direction), 20 repeated springing in each direction.
- We continued cranially mobilizing the tibiofibular joint of the left leg dorsally, 20 repeated springing.
- Walking with the (WalkAid), patient is using one crutch on the healthy side, distance achieved is 40m, he walked alone, and I was just walking beside him for safety.
- We also tried walking on the stairs, I was under him while going down stairs, and behind him while going up stairs, patient had to hold the handrail and with the other hand holding the crutch. Walking improved.

Objective: On my point view, I noticed many changes and improvements which we expected before starting the first session

Subjective: after the last session, patient was grateful for my effort, and promised that he will be better soon and will always remember the instructions which was giving from us as a physiotherapist.

3.6 Final Kinesological Examination

3.6.1 Postural Examination

Back view:

- Slight flat feet.
- Prominent Achilles tendon of the right foot in comparison with the left foot.
- Calf are symmetrical in contour
- Popliteal of knees in the same line
- (Less) Pronation of the left arm.
- (Slightly) Elevation and protraction of the right scapula.
- Right shoulder (slightly) higher than left shoulder.
- Head shifted slightly to the right side.
- Gap between thighs

Lateral view in both right/left sides:

- Head protracted
- Kyphosis in thoracic spine
- Flat lumber spine.
- Extension of the both knees
- Arms are slightly flexed in both elbows
- (Less) Pronation of the left arm.
- Right fingers are extended, left fingers are slightly flexed.
- Flat both feet.

Front view:

- Right big toes slight valgus (hallux valgus).
- Base of support are in the same line with knees and hips (good aliment)
- (Less) Pronation in the left arm.

- Belly button shifted slightly to the right side.
- Right nipple lower than the left nipple.
- Right shoulder (less) protraction.
- Elevated right shoulder (slightly).

3.6.2 Gait Analysis

During the final assessment of the gait: we noticed a high progress, in the initial examination patient was walking with a walker and 2 physiotherapist help, now he use only one crutch, and no need for help, he still can't walk on stairs alone for his safety, but the main issue of the foot drop was nearly solved, but needs more time to achieve the maximum dorsal flexion He still has slow walking pattern and short length of the steps.

3.6.3 Breathing Examination

While patient was in supine position he was asked to breathe in and out three times, finding: patient still using mostly the lower abdomen and slightly upper abdomen for breathing. Breathing Rytheme was good, it was nicely controlled. The Ratio of breathe in – breathe out was 1:2

3.6.4 Soft Tissue Examination (According to Lewit 2010)

While patient in prone we started checking the thoracolumbar area and the cervicothoracic area in both side there were no restriction found. In the upper extremity there is no restriction of the left lower arm both medially and literally anymore, in the lower extremity there is still a slight restriction of left lower leg medial direction. Other tissues has no restriction

3.6.5 Palpation of Pelvis

We palpated the pelvis to check if there is any kind of obliquity, we found out that the

Anterior superior iliac spine: both in the same line (symmetrical)

Posterior inferior iliac spine: both in the same line (symmetrical)

Iliac crests are in the same line (symmetrical)

3.6.6 Anthropometric Measurements Examination

Length of Lower and Upper Extremities	Left	Right
Functional length ASIS	103 cm	103 cm
Anatomical length	97 cm	97 cm
Thigh	50 cm	50 cm
Leg	46 cm	46 cm
Foot	30 cm	30 cm
Whole arm	75 cm	75 cm
Upper arm	31 cm	31 cm
Forearm	27 cm	27 cm
Hand	17 cm	17 cm

Table 17- Final Anthropometric measurements of length of lower and upper extremities

Circumferences of Lower and Upper Extremities	Left	Right
Above the knee cap 15 cm (whole quadriceps)	52 cm	53 cm
Above the knee cap 10 cm (vastus medialis)	46 cm	47 cm
Knee	36 cm	36 cm
Calf	33 cm	35 cm
Ankle	31 cm	31 cm
Foot	26 cm	26 cm
Upper Arm	26 cm	28 cm
Forearm	26 cm	27 cm

Table 18- Final Anthropometric measurements of circumferences of lower and upper extremities

3.6.7 Examination of Range of Motion (According to Kendall 2005)

Final Range of Motion of the Upper Extremity:

Joint	Plane	Right		left	
Shoulder	Sagittal Frontal Rotation.	Active (20-0-180) (140-0-0) (90-0-70)	Passive (20-0-180) (150-0-0) (90-0-80)	Active (15-0-170) (140-0-0) (85-0-70)	Passive (15-0-180) (150-0-0) (90-0-80)
Elbow	Sagittal	Active (90-0-140)	Passive (0-0-145)	Active (0-0-140)	Passive (0-0-145)
Wrist	Sagittal	Active (70-0-75)	Passive (80-0-85)	Active (55-0-65)	Passive (65-0-75)

Table 19- Final Range of motion of the upper extremity.

Final Range of Motion of the Lower Extremity:

Hip	Sagittal Frontal Rotation.	Active (10-0-70) (40-0-15) (40-0-40)	Passive (10-0-80) (45-0-20) (45-0-45)	Active (0-0-70) (25-0-10) (10-0-30)	Passive (90-0-80) (40-90-15) (30-0-40)
Knee	Sagittal	Active (0-0-120)	Passive (0-0-130)	Active (0-0-100)	Passive (0-0-110)
Ankle	Sagittal	Active (20-0-40)	Passive (25-0-50)	Active (10 -0- 40)	Passive (15 -0- 45)

Table 20- Final Range of motion of the lower extremity.

3.6.8 Muscle Tonicity Examination

Due to the patient current state, Muscles tonicity which needs to be examined are recorded and listed in the following table:

Muscle	Hypo tone		Hyper tone		Physiological tone	
	Right	Left	Right	Left	Right	left
Soleus					√	√
gastrocnemius					√	√
Quadriceps (rectus femoris, vastus medialis, vastus lateralis)					√	√
Hamstrings					√	√
Adductor magnus					√	√
Biceps brachi					√	√
Triceps brachi			√			√
Supraspinatus					√	√
Infraspinatus					√	√
Pronator teres				√	√	
Supinator					√	√
Flexor carpi radiails					√	√
Flexor carpi ulnaris					√	√
Flexor digiti muscles					√	√
Extensor carpi radialis					√	√
Extendor carpi ulnaris					√	√
Extensors digiti muscles					√	√

Table 21-Final Examination of muscle tonicity.

3.6.9 Examination of Superficial Sensation

(√) indicates normal sensation (×) indicate hyposensitivity

Nerve root	Superficial	
	Right	Left
C5	√	√
C6	√	√
C7	√	√
C8	√	√
T1	√	√
T2	√	√
T3	√	√
L2	√	√
L3	√	√
L4	√	√
L5	√	√
S1	√	√
S2	√	√

Table 22-Final Examination of superficial sensation

3.6.10 Examination of Deep Sensation

(√) can identify the direction (×) not able to identify the direction

Fingers and toes	Deep sensation (pain)	
	Right	Left
Big toe	√	√
Small toe	√	√
Other toes	√	√
thumb	√	√
3rd finger	√	√
5th finger	√	√

Table 23- Final Examination of deep sensation

3.6.11 Examination of the Reflexes

The results of the examinations are listed in the following tables:

Primitive Reflex	Response
The Glabellar tap Reflex	Negative
Palmar Grasping Reflex	Negative
Palmomental Reflex	Negative
Snout Reflex	Negative

Table 24- Final Examination of primitive reflexes.

Superficial reflexes	Response
The corneal and conjunctival reflexes	Negative
The abdominal reflex Ssegmenat of upper abdomin T7-T9, mid abdomin T9-T10, lower abdomin T11-T12	Normal response, the umbilicus follow the line been drawn.
plantar reflex (Babinski)	Positive

Table 25- Final Examination of superficial reflexes.

Deep Tendon Reflexes	Spinal cord Segment	Left Side	Right Side
Biceps	C5-C6	3	2
Triceps	C7	3	2
Flexors	C8	3	2
Patellar	L2-L4	3	3
Achilles	L5-L2	2	2

Table 25-Final Examination of deep tendon reflexes.

3.6.12 Examination of Pyramidal Tract Sign

Paretic Sign	Result
Mingazzini (upper)	√
Mingazzini (lower)	√
Dufour	√
Barré	√
Hanzal	√
Rusedskij	√

Table 26- Final Examination of paretic sign.

3.6.13 Examination of Spastic Sign

(√) indicates positive sign (×) indicates negative sign

Spastic Sign	Right	Left
Juster	×	√
Hoffman	×	√
Babinski´	×	√
Vítek	×	√
Roche	×	√
Oppenheim	×	×
Chaddock	×	√
Rossolimo	×	√

Table 27-Final Examination for spastic sign.

3.6.14 Cranial Nerves Examination

(√) indicates physiological **(×)** indicates impaired.

Cranial nerve	Result
I. Olfactory	**(√)**

II. Optic	(√)
III. Oculomotor	(√)
IV. Trochlear	(√)
V. Trigeminal	(√)
VI. Abducens	(√)
VII. Facialis	(×)
VIII. Vestibulocochlear	(√)
IX. Glossopharyngeal	(√)
X. Vagus	(√)
XI. Accessory	(√)
XII. Hypoglossal	(√)

Table 28-Final Examination of cranial nerves.

3.6.15 Ashworth Scale Test for Spasticity

Muscles tested	**Score**
Biceps brachii	2
Pronator teres	1+
Flexors Digitorum Profundus	1
Hamstrings	1+
Quadriceps	0
Gastrocnemius	1+
Soleus	1+

Table 29-Final Examination of spasticity according to Ashworth scale.

3.6.16 Joint Play Examination (According to Lewit 2010)

Upper Extremity		
Joint	**Left**	**Right**
Shoulder joint ventrodorsal-and caudal direction.	No Restriction	No Restriction
Acromioclavicular Joint ventrodorsal-craniocaudal direction	No Restriction	No Restriction
Sternoclavicular Joint ventrodorsal-craniocaudal direction	No Restriction	No Restriction
Elbow Joint medial-lateral direction	No Restriction	No Restriction
Radiocarpal Joint	No Restriction	No Restriction
Carpometacarpal Joint	No Restriction	No Restriction
Carpal Bones	No Restriction	No Restriction
Carpometacarpal Joint of the thumb	No Restriction	No Restriction
Metacarpophalangeal Joints	No Restriction	No Restriction
Interphalangeal Joints	No Restriction	No Restriction

Table 30-Final examination of joint play upper extremity.

Lower Extremity		
Sacroiliac joint	No Restriction	No Restriction
Patella cranial – caudal and medial-lateral direction	No Restriction	No Restriction
Knee joint medial – lateral direction	No Restriction	No Restriction
Tibiofibular joint dorsal - plantar direction	Restriction in ventral direction	No Restriction
Talocrural joint dorsal - plantar direction	No Restriction	No Restriction
Subtalar joint dorsal -plantar direction	No Restriction	No Restriction
Lisfranc's joint dorsal - plantar direction	No Restriction	No Restriction
Chopart's joint dorsal - plantar direction	Restriction in dorsal direction	No Restriction
Metatarsophalangeal Joints medial-lateral., dorsal-plantar direction	No Restriction	No Restriction

Interphalangeal Joints medial-lateral., dorsal-plantar direction	No Restriction	No Restriction

Table 31- Final Examination of joint play lower extremities

3.7 Final Examination Conclusion and Evaluatin of the Therapy

After completing all the final kinesological examinations we recorded a significant improvement in all aspects which are shown in the tables above with red (highlighting We can conclude and evaluate the improvement which has been achieved. Here are all the improvement after the therapy sessions: The ROM increased after 2 weeks of exercising using plenty of methods shown above resulted with a significant increasing of the ankle joint in dorsal flexion and the wrist joint in both palmar and planter direction.

Before: active (-10 -0- 40) passive (5 -0- 45)After: active (10 -0- 40) Passive (15-0- 45)**Ankle**

Before: active (40-0-60) passive (65-0-75) After: active (55-0-65) Passive(65-0-75)**Wrist**

After we assisted the patient gait pattern, we found out that his main issue is his left foot drop. Within 2 weeks we reached with the patient a level of dorsal flexion active (10 -0- 40) that enables him to walk alone confidently with only one crutch. The most effective therapy which improved his gait was using Functional Electro-stimulation (FES) such as (WalkAid) also using different types of exercises

Moreover a comparison between the initial and final examination of the muscles tonicity, In the initial examination we found out some hyper and hypo tonicity muscles, we facilitate the hypotonic and relaxes the hypertonic muscles, The result was a normal tone of most of these muscles (the schedule of the muscles tonicity above shows the new gained tonicity highlighted in red colour)

During the initial neurological examination, the cranial nerve assessment shows an impaired nerve 7 facials, and the final examination still shows (an impaired) a positive sign but facial muscles slightly regained its function. In the final Examination of the pyramidal sign: (paretic sign) still show a positives signs except upper Mingazzeni, In the other hand (spastic sign) all tests indicates a positive sign except Oppenheim which shows a negative sign. In the cerebellum final examination we noticed an improvement in the finger to nose attempt test show better and accurate pointing his nose, he was able to touch his nose. Also heel to shin coordination shows better control, he was able to drag the heel all the way distally without falling out of the shin.

In the final examination the patient still show a positive result of Romberg 2 and 3 test (Romberg 1**:** Able to perform it., Romberg test 2: lost the balance in 5s., Romberg test 3: lost the balance in 2s) During the finial examination of the reflexes we still recorded a negative responses on the primitive reflex, In the other hand the superficial reflexes also shows a negative responses except the plantar reflex (Babinski) which still give us a positive response. Comparing between the initial and final examination of the deep tendon reflexes shows that the triceps C7 and patella L2-L4 decreased in degree as I mentioned in the table above from 4 degree which consider as hyper-reflexive response, to 3 degree which consider as a normal reflex response. According to (Vele).

Moreover during the final examination of the superficial sensation, the nerve root (S1) has improved from hyposensitive to normal sensation and the deep sensation still shows a normal sensation in all segment from C5 until S2. Also the deep position sense shows that the patient is able to indicate each finger or toe movement. We also found out during the finial examination an improvement of the muscles spasticity which was tested by Ashowrth scale, We noticed a decrease in the muscles tone of (pronator teres, flexor, digitorum prefunds, soleus, gastrocnemius) In comparison the initial examination was degree number (2) marked increase in muscle tone. In the other hand the final examination is degree number (1) Slight increase in muscle tone. There were also some restrictions in the Joint Play during the initial examination as we mentioned above on the table of the joint play. After the mobilization we can see an improvements which shows a free joint play (Highlighted with a red colour above on the table) according to Lewit

Moreover speaking about his upper limb dysfunction especially his hand and fingers in the initial examination patient grasp was poor, he wasn't able to grasp a paper money and coins from the table, In the final examination we saw an improvement of the grasp he is now able to grasp the paper money but still can't grasp the a coin from the table. He is able now to reach out his ear over his head with his affected hand, although he wasn't able to reach it before. In general the patient's activity became easier as he claimed, he is now able to use his hands better than before. ADL has also improved but still didn't reach the maximal dependent, in the initial examination the patient scored 55 point which consider to be medium degree of dependent, In the final examination the patient scored 65 point which consider to be a 65-95 points: light dependence. According to Barthel test. I'm sure that he will reach more dependency in the next following days if he keeps doing what we instructed him.

Also one of the plans of therapy was to regain his speech ability which was slightly affected, with a help of the speech therapist, he regained totally the ability of speaking after giving him different types of exercises for the face muscles and the tongue articulation, the exercises basically was to make all face expression such as smiling, showing teeth, frown, fish face, opening mouth, cheek puff right and left, tongue tip to chin, tongue tip to nose tongue tip inside cheek, tongue tip around teeth.

3.8 Prognosis

the patient prognosis has many factors from my point view, these factors plays an important role to give the patient opportunity to regain his functions and restore his ability which I found them om my patient during the anamnesis, which shows that the patient is free of abuses, also during this 2 weeks he was active and cooperating with all the exercise, that shows how he's insisting to go back so quickly to his normal function as possible, also what I saw that in this 2 weeks we achieved big improvement due to the work done and the determination of the patient which led him to this level.The patient will continue his rehabilitation in Kladrupy Rehabilitation Centre. In order to regain the lost function and to achieve more dependency, Patient should keep doing the exercises as a self-therapy and should also follow the physiotherapist instructions.

4. Conclusion

In conclusion 2 weeks ago the patient was in the neurological sub-acute department after an ischemic stroke which affected his left limbs. Patient was not able to stand or walk alone, he needed a walker with 2 personal assistants. His disability was clearly observed from the first sight. During the initial examination we were aware of his current-state, and according to the outcomes from the initial examination we made a short and long rehabilitation plan to bring him back to his normal life. It was a challenge for us and him to achieve the goals, but with the cooperation of the entire team in Kladno hospital, doctors, pharmacologist, nurses, physiotherapist, ergotherapist, radiologist and speech therapist) made is possible to bring him back to his function ability.

Seeing my patient improving and gaining the lost abilities and functions made me proud of him and our work. The smile in his face worth all our, I learn that the relationship between the patient and the physiotherapist is so important achieve the best results of the therapy. I proud of the knowledge which I received and grateful to all my teachers at the Charles university.

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6. Supplements

6.1 List of tables

6.2 List of Figures

6. 3 List of Abbreviation

(ADL) Stands for → Activities of Daily Living
(MRI) Stands for → Magnetic Resonance Imaging
(CVA) Stands for → Cerebrovascular Accident
(FES) Stands for → Functional Electrical Stimulation
(CT) Stands for → Computed Tomography
(TPA) Stands for → Tissue Plasminogen Activator
(TENS) Stands for → Transcutaneous Electrical Nerve Stimulation
(UE) Stands for → Upper Extremity
(PNF) Stands for → Proprioceptive Neuromuscular Facilitation
(BMI) Stands for → Body Mass Index
(ROM) Stands for → Range of motion

6.4 Ethical Board

CHARLES UNIVERSITY
FACULTY OF PHYSICAL EDUCATION AND SPORT
José Martího 31, 162 52 Prague 6-Veleslavín

Application for Approval by UK FTVS Ethics Committee

of a research project, thesis, dissertation or seminar work involving human subjects

The title of a project: Physiotherapeutic procedure for patient after ischemic cerebrovascular accident (stroke) in the pons.

Project form: bachelor
Period of realization of the project: February 2017
Applicant: Abdulaziz Abdullah Alrasheed.
Main researcher: Abdulaziz Abdullah Alrasheed.
Co-researcher(s)
Supervisor (in case of student's work): doc. PeadDr. Dagmar Pavlů. CSc.
Financial support:

Project description: This project is about a 54-year-old patient in sub-acute rehabilitation department at Oblastni nemocnice Kladno after ischemic stroke in the pons. This project provides the total initial examination and therapy using the methods which. I have been taught in the Faculty of Physical Education and Sport, Charles University, Prague. Procedure starts by total kinesiological exanimation according to his diagnosis, then we suggest the short and long rehabilitation plan with the methods that we will follow for the therapy such as DNS,PNF,PIR,(Passive stretching) AND sensomotoric training with a recommendation and supervision by Bc.Tomas Modlinger.

Ensuring safety within the research: I ensure that there is no invasive methods, the implementations is safe with respecting the conditions and the rules of the hospital and under the control and supervision of Bc.Tomas Modlinger.

Ethical aspects of the research: The patient is adult. Personal data will be anonymised.

Informed Consent: attached

It is a duty of **all participants of the research team** to protect life, health, dignity, integrity, the right to self-determination, privacy and protection of the personal data of all research subjects, and to undertake all possible precautions. Responsibility for the protection of all research subjects lies on the researcher(s) and not on the research subjects themselves, even if they gave their consent to participation in the research. All participants of the research team must take into consideration ethical, legal and regulative norms and standards of research involving human subjects applicable not only in the Czech Republic but also internationally.

I confirm that this project description corresponds to the plan of the project and in case of any change, especially of the methods used in the project, I will inform the UK FTVS Ethics Committee, which may require a re-submission of the application form.

In Prague, 22.2.2017 Applicant's signature:

Approval of UK FTVS Ethics Committee

The Committee: Chair: doc. PhDr. Irena Parry Martínková, Ph.D.
Members: prof. PhDr. Pavel Slepička, DrSc.
doc. MUDr. Jan Heller, CSc.
PhDr. Pavel Hráský, Ph.D.
Mgr. Eva Prokešová, Ph.D.
MUDr. Simona Majorová

The research project was approved by UK FTVS Ethics Committee under the registration number: 073/2017
Date of approval: 23.2.2017

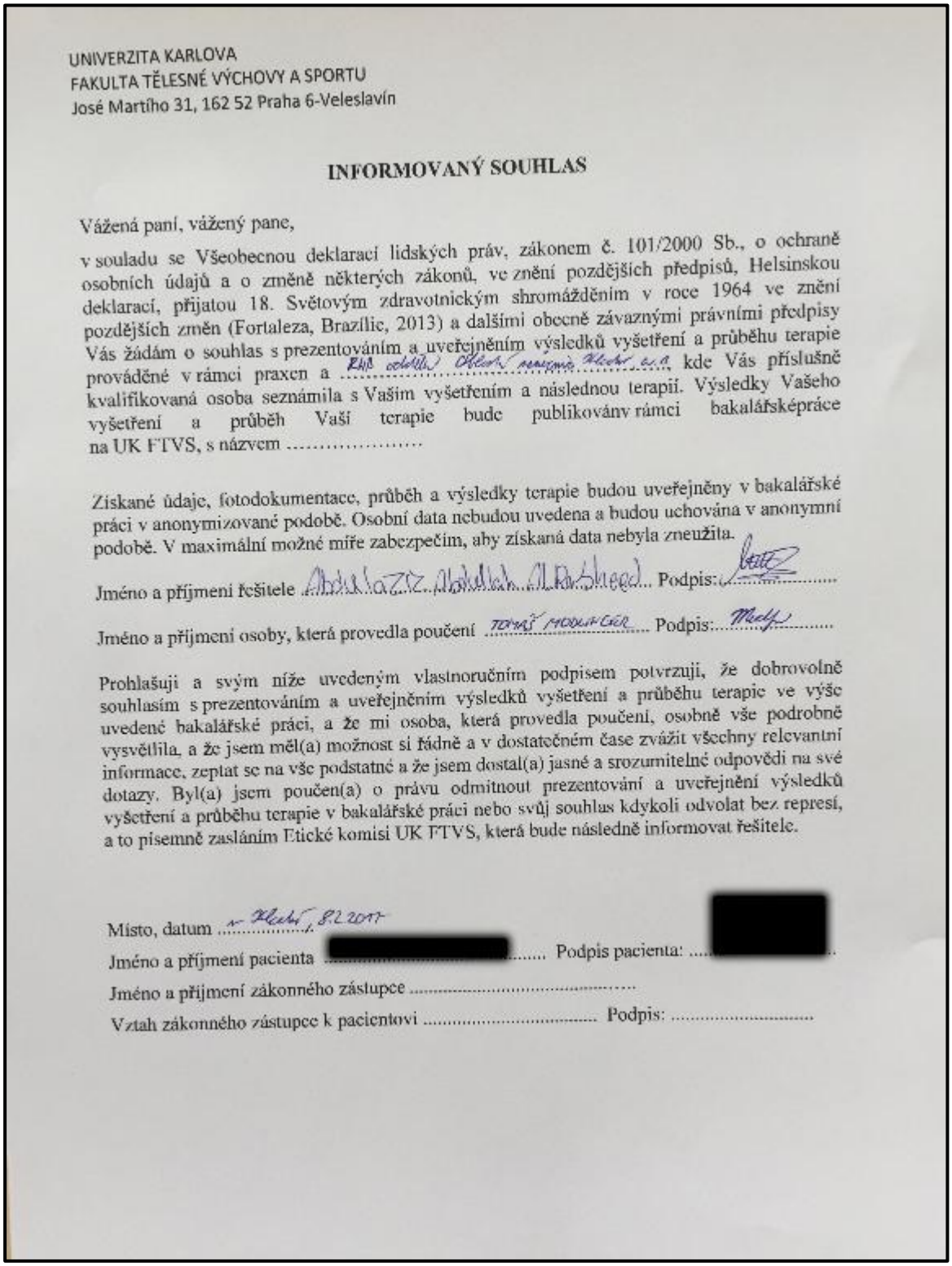
UK FTVS Ethics Committee reviewed the submitted research project and **found no contradictions** with valid principles, regulations and international guidelines for carrying out research involving human subjects.

The applicant has met the necessary requirements for receiving approval of UK FTVS Ethics Committee.

Signature of the Chair of
UK FTVS Ethics Committee

Stamp of UK FTVS
UNIVERZITA KARLOVA
Fakulta tělesné výchovy a sportu
José Martího 31, 162 52, Praha 6
– 20 –

6.5 INFORMOVANY SOUHLAS



UNIVERZITA KARLOVA
FAKULTA TĚLESNÉ VÝCHOVY A SPORTU
José Martího 31, 162 52 Praha 6-Veleslavín

INFORMOVANÝ SOUHLAS

Vážená paní, vážený pane,

v souladu se Všeobecnou deklarací lidských práv, zákonem č. 101/2000 Sb., o ochraně osobních údajů a o změně některých zákonů, ve znění pozdějších předpisů, Helsinskou deklarací, přijatou 18. Světovým zdravotnickým shromážděním v roce 1964 ve znění pozdějších změn (Fortaleza, Brazílie, 2013) a dalšími obecně závaznými právními předpisy Vás žádám o souhlas s prezentováním a uveřejněním výsledků vyšetření a průběhu terapie prováděné v rámci praxen a [illegible], kde Vás příslušně kvalifikovaná osoba seznámila s Vaším vyšetřením a následnou terapií. Výsledky Vašeho vyšetření a průběh Vaší terapie bude publikovány rámci bakalářsképráce na UK FTVS, s názvem .....

Získané údaje, fotodokumentace, průběh a výsledky terapie budou uveřejněny v bakalářské práci v anonymizované podobě. Osobní data nebudou uvedena a budou uchována v anonymní podobě. V maximální možné míře zabezpečím, aby získaná data nebyla zneužita.

Jméno a příjmení řešitele [illegible] Podpis: [illegible]

Jméno a příjmení osoby, která provedla poučení [illegible] Podpis: [illegible]

Prohlašuji a svým níže uvedeným vlastnoručním podpisem potvrzuji, že dobrovolně souhlasím s prezentováním a uveřejněním výsledků vyšetření a průběhu terapie ve výše uvedené bakalářské práci, a že mi osoba, která provedla poučení, osobně vše podrobně vysvětlila, a že jsem měl(a) možnost si řádně a v dostatečném čase zvážit všechny relevantní informace, zeptat se na vše podstatné a že jsem dostal(a) jasné a srozumitelné odpovědi na své dotazy. Byl(a) jsem poučen(a) o právu odmítnout prezentování a uveřejnění výsledků vyšetření a průběhu terapie v bakalářské práci nebo svůj souhlas kdykoli odvolat bez represí, a to písemně zasláním Etické komisi UK FTVS, která bude následně informovat řešitele.

Místo, datum [illegible]

Jméno a příjmení pacienta [redacted] Podpis pacienta: [redacted]

Jméno a příjmení zákonného zástupce .....

Vztah zákonného zástupce k pacientovi ..... Podpis: .....